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Motion Control

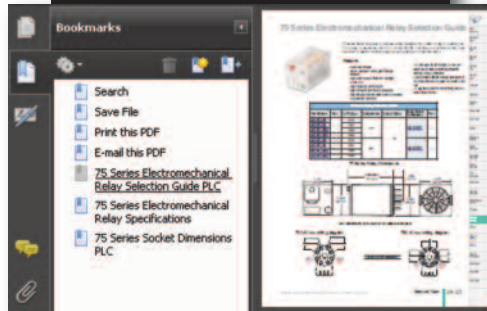
Sure
servo

Sure
step

Sure
gear



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Motion Control **emc-1**

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and Steppers

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SureStep® Stepping System Overview

High-performance microstepping drives with high-torque stepping motors

SureStep stepping systems provide simple and accurate control of position and speed where open-loop control and cost are considerations. Pulses (or "step" and "direction" signals) from the DirectLOGIC family of PLCs or other indexers and motion controllers are "translated" by the microstepping drive into precise movement of the stepping motor shaft. The SureStep stepping motors use 2-phase technology with 200 full steps per revolution or 1.8° per full step. Older type stepping motor drives, which operate stepping motors in full step mode, can result in stalling or lost motion due to potential problems with low speed mechanical vibration (usually between 100 to 200 RPM). To minimize this vibration problem, the SureStep microstepping drives use advanced microstepping technology to smooth the motor motion and stepping response.

The STP-DRV-4035 has selectable microstep resolutions of 400 (half-step); 1,000 (each full step ÷ 5 microsteps); 2,000 (÷ 10); or 10,000 (÷ 50).

The STP-DRV-6575 has selectable resolutions of 200 (full-step); 400 (half-step); 2,000; 5,000; 12,800; or 20,000 steps per revolution.

The advanced drives (STP-DRV-4805, STP-DRV-80100) have software-selectable resolutions ranging from 200 (full step) to 51,200 (÷ 256) steps per revolution.

The advanced drives can operate with traditional high-speed inputs, but can also be commanded via 0–5V analog input. They have an internal indexer that can accomplish point-to-point moves controlled via ASCII communication.

Standards and Agency Approvals

How fast can my system go?

Maximum Potential Speed Chart (rpm) *					
PLC		SureStep Drive Steps/Rev Selection **			
Model	Fastest Output	400 Steps/Rev	1000 Steps/Rev	2000 Steps/Rev	10,000 Steps/Rev
DL05, DL105	7kHz	1,050	420	210	42
DL06	10 kHz	1,500	600	300	60
H0/H2/H4/T1H-CTRIO	25 kHz	3,750	1,500	750	150
H2-CTRIO2	250 kHz	37,500	15,000	7,500	1,500
P3-HSO	1MHz	150,000	60,000	30,000	6,000

* These speeds are theoretical maximums. See torque curves of specific motors for their rpm limits.

** Full step (200 steps/rev) will allow higher top speed. Full stepping, however, can create vibration at low speed.

FREE configuration software!

SureStep Pro configuration software is available that makes setting parameters a snap for the advanced drives (STP-DRV-4850 & STP-DRV-80100)! Download free from our website:

<http://support.automationdirect.com/products/surestep.html>

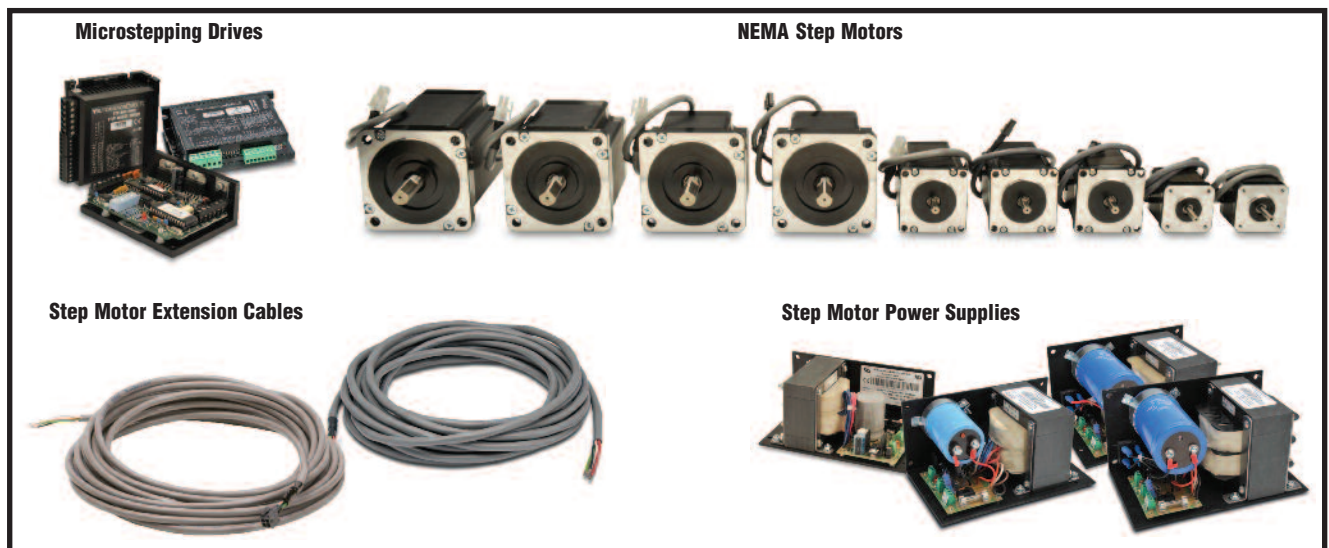
Stepping Motor RPM = (A ÷ B) x (60 seconds/minute)

Where: A = PLC output frequency (pulses per second)
B = microstepping resolution selection (steps/revolution)

Maximum RPM =		Steps/Sec A		Steps/Rev B		Sec/Min
Example 1:	1,500 =	10,000	÷	400	X	60
DL06 with 10 kHz Built-in Pulse Output						
Example 2:	3,750 =	25,000	÷	400	X	60
Hx-CTRIO with 25 kHz Pulse Output						

Four components to make a complete system

Choose a drive, motor, motor extension cable and power supply



SureStep[®] Stepping System Overview

Stepping System : Head to Head

AutomationDirect **VS.** Competition

Hey - I can do the math! - AutomationDirect

A complete 2-axis SureStep[™] Stepping System for less than just the competition's stepping drives.

SureStep[™] NEMA 23 System Long Stack



\$421
Complete
2 Axis System

VS.

Parker

E-DC

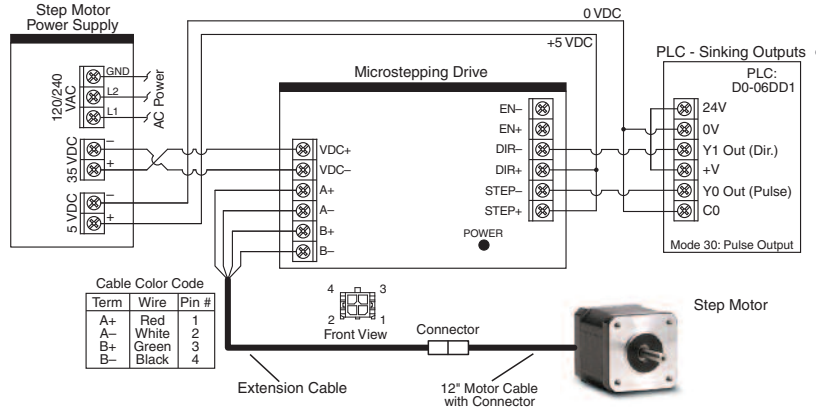
\$622
for 2 drives



Ours includes:

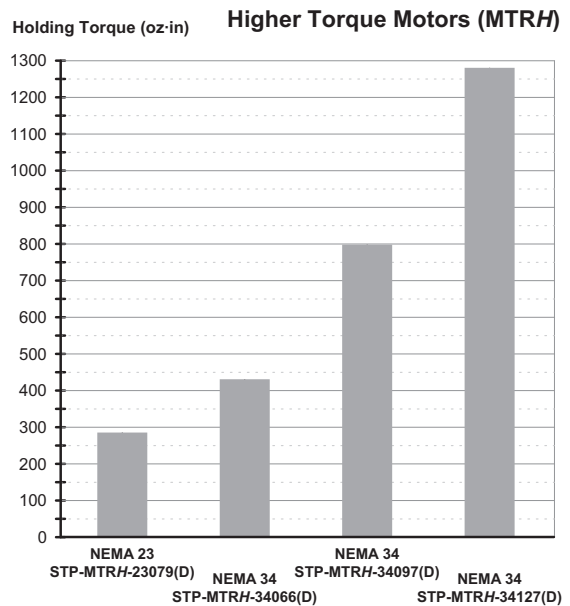
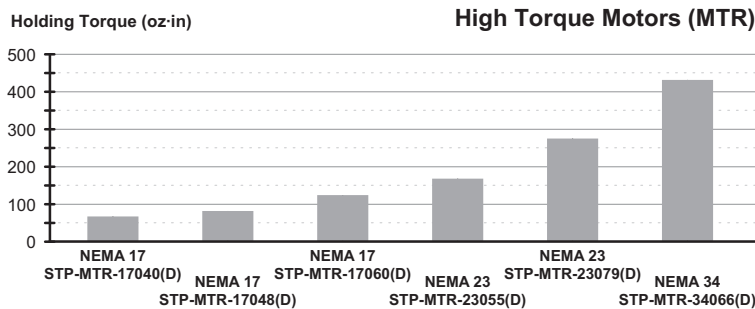
- Two Microstepping Drives (STP-DRV-6575)
- Two Stepper Motors (STP-MTR-23079)
- One Power Supply (STP-PWR-3204)
- Two Extension Cables (STP-EXT-020)

All prices are U.S. published prices. AutomationDirect prices are from April 2014 Price List. Parker prices are from <http://buy.compumotor.com> 2/20/2014.



High-torque stepping motors with 1-ft. cable and 4-wire locking connector

The SureStep stepping family has twenty high-torque motors to handle a wide range of automation applications such as woodworking, assembly, and test machines. The motors are available in both single-shaft and dual-shaft configurations. Our square frame or "high-torque" style stepping motors are the latest technology, resulting in the best torque to volume. We have NEMA 17, 23, and 34 mounting flanges and holding torque ranges from 61 to 1288 oz-in. Optional 20-foot extension cables with locking connectors are available to interface any of the stepping motors to the microstepping drive. The extension cables can be easily cut to length, if desired.



High-performance microstepping drive

SureStep microstepping drives

(STP-DRV-4035 & STP-DRV-6575)

- Two models available
- Standard high-speed pulse input (pulse and direction)
- On-board or removable screw terminals for easy hook-up
- Optically-isolated inputs ready for +5VDC logic from DirectLOGIC PLCs, or 5-24 VDC (depending on model).
- No software or add-on resistors required for drive configuration; dipswitch and/or rotary-dial set-up
- Dipswitch used for built-in self-test, microstep resolution selection, current level selection, and optional idle current reduction.

SureStep advanced microstepping drives

(STP-DRV-4850 & STP-DRV-80100)

All the features of the high-performance drive, plus:

- Software configurable
- 200 - 51,200 microsteps (software selectable)
- High-speed pulse input (Quadrature, cw/ccw, pulse/direction)
- Analog velocity mode (0-5v or potentiometer)
- Internal indexer (point-to-point moves via ASCII command)

Linear power supplies

- 32V @ 4A, 48V @ 5A, 48V @ 10A, 70V @ 5A
- Input and output fuses included on power supplies
- Includes 5 VDC Logic supply for all low voltage signals

SureStep® Choose your SureStep System

1. Choose a motor

Determine the torque and speed required by your application. Then look at the motor speed-torque curves in the "SureStep Stepping System Motors" section of this catalog chapter. Choose a motor that can run your application with plenty of speed and torque reserve (most stepper systems should have a 100% safety margin for torque).

NEMA 17, 23 and 34 mounting flanges

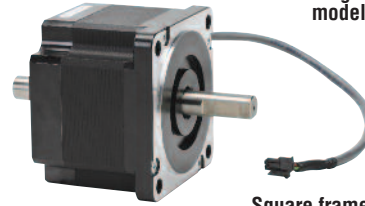
Twenty bipolar step motors to cover a wide range of applications

Holding torque ranges from 61 to 1288 oz-in



Single-shaft and Dual-shaft models available

1-ft cable (4-wire) with locking connector on the end



Square frame style produces high torque and achieves best torque to volume ratio

2. Choose a motor extension cable

Our 20-ft motor extension cables have a locking connector that mates up to the motor cable. The extension cables allow you to quickly connect the motor to the drive without having to splice wires or cut any cables. If you chose an STP-MTR-xxxx motor, select an STP-EXT-020 cable. If you chose an STP-MTRH-xxxx motor, select an STP-EXTH-020 cable. (The "H" motors and cable can handle higher motor current)

20-foot extension cable with locking connector; for use with all SureStep motors

STP-EXT-020
STP-EXTH-020



3. Choose a drive

This chart is a quick selection guide. For a full list of features, check out the Technical Info later in this chapter.

What you need	STP-DRV-4035	STP-DRV-4850	STP-DRV-6575	STP-DRV-80100
32V Speed-Torque Curve (from Step 1)	✓	✓	✓	✓
48V Speed-Torque Curve (from Step 1)	—	✓	✓	✓
70V Speed-Torque Curve (from Step 1)	—	—	—	✓
Pulse & Direction Input	✓	✓	✓	✓
More than 3.5A/motor phase	—	✓	✓	✓
More than 5A/motor phase ("H" motors)	—	—	✓	✓
Internal Indexing (Drive can move from Point A to Point B with a serial communication command)	—	✓	—	✓
Analog Velocity Input	—	✓	—	✓

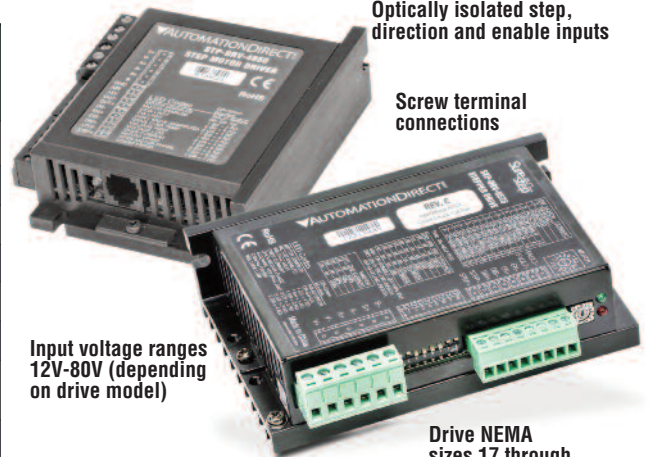
Optional idle current reduction

Adjustable microstep resolutions

0.1 to 10 amps (depending on drive model)

Optically isolated step, direction and enable inputs

Screw terminal connections



Input voltage ranges 12V-80V (depending on drive model)

Drive NEMA sizes 17 through 34 step motors

...in 4 easy steps

4. Choose a power supply

Since all SureStep motors can operate at 32V, 48V, and 70V, the selection of a power supply is dependent on the selected speed-torque curve of the motor and on the selection of drive. Choose a power supply that matches the desired speed-torque curve

and stays within the voltage limit of the selected drive. Each power supply has incoming AC and outgoing DC fusing. There is also an electronically overload protected 5V supply for all your logic needs.

Permissible Drive/Power Supply Combinations

Power Supply	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005
Drive				
STP-DRV-4035	✓	—	—	—
STP-DRV-4850	✓	✓	✓	—
STP-DRV-6575	✓	✓	✓	—
STP-DRV-80100	✓	✓	✓	✓

For systems that use multiple drives and only one power supply, please read our SureStep User Manual (under "Product Documentation") to properly size multiple systems.

120 or 240 VAC, 50/60 Hz
power input (switch
selectable)

Screw terminal AC input and
DC output connections

32V, 48V and 70V
linear supplies

Power ON LEDs

Unregulated
linear supplies
perfect for
stepper systems

Input and output
fusing included



5 VDC $\pm$ 5% at 500 mA
regulated logic power

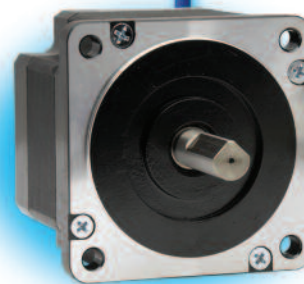
2-Phase Microstepping Drive

Motor Extension Cable

Typical System

Step Motor Power Supply

NEMA Step Motor



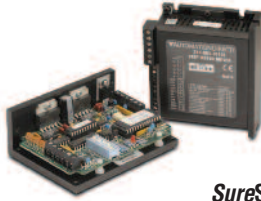
SureStep® Stepping System Components

SureStep® System



**SureStep
Step Motor Power Supply**

+



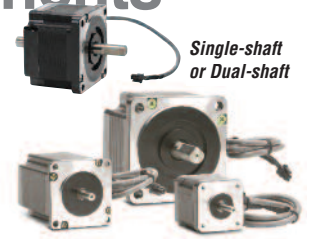
**SureStep
Microstepping Drive**

+



**SureStep
Extension Cable**

+



**SureStep
Connectorized Step Motor**

Single-shaft
or Dual-shaft

SureStep stepping system includes:

- Four step motor power supplies
- Two DIP-switch configurable microstepping drives
- Two software configurable advanced microstepping drives
- Two motor extension cables
- Twenty step motors (NEMA 17, 23, 34 frame sizes; single & dual shaft)

Standard stepper drive features

(STP-DRV-4035 & STP-DRV-6575)

- Low cost, digital step motor driver in compact package
- Operates from Step & Direction signals, or Step CW & Step CCW (jumper selectable)
- Fault output (-6575 only) & Enable input
- Optically isolated I/O
- Digital filters prevent position error from electrical noise on command signals; jumper selectable: 150 kHz or 2MHz (-6575 only)
- Rotary or DIP switch easily selects from many popular motors
- Electronic damping and anti-resonance (-6575 only)
- Automatic idle current reduction to reduce heat when motor is not moving; switch selectable: 50% or 90% of running current
- Switch selectable step resolution: (-DRV-4035) 400–10,000 steps per revolution; (-DRV-6575) 200–20,000 steps per revolution
- Switch selectable microstep emulation provides smoother, more reliable motion in full and half step modes
- Automatic self test (switch selectable)
- Operates from a 24–65 VDC or 12–40 VDC power supply, depending upon model
- Running current from 0.5–7.5A

Advanced stepper drive features

(STP-DRV-4850 & STP-DRV-80100)

- Max 5A, 48V and max 10A, 80V models available
- Software configurable
- Programmable microsteps
- Internal indexer (via ASCII commands)
- Self test feature
- Idle current reduction
- Anti-resonance
- Torque ripple smoothing
- Step, analog, & serial communication inputs
- Serial communications allow point-to-point positioning

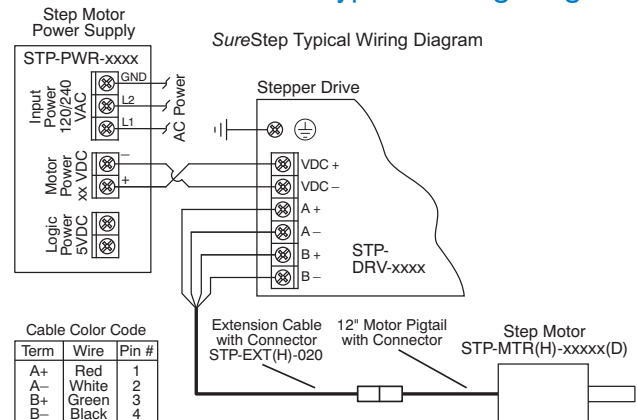
Motor features

- High torque, 2-phase, bipolar, 1.8° per step, 4-lead
- Available in single-shaft and dual-shaft models
- Connectorized
- (6) NEMA 17 motors
- (6) NEMA 23 motors
- (8) NEMA 34 motors

Power supply features

- Linear, unregulated DC power supplies
- 120/240 VAC selectable input
- 32V, 48V, 70V DC output models available
- All models have additional 5VDC, 500 mA regulated logic supply
- Fusing included for both incoming AC and outgoing DC
- 5V supply has electronic overload protection

Typical Wiring Diagram



SureStep Power Supply / Drive Compatibility

Drive ⁽¹⁾⁽²⁾	Recommended Power Supply ⁽¹⁾⁽²⁾			
Model #	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005
STP-DRV-4035	✓	No	No	No
STP-DRV-4850	✓	✓	✓	No
STP-DRV-6575	✓	✓	✓	No
STP-DRV-80100	✓	✓	✓	✓

1) Do NOT use a power supply that exceeds the drive's input voltage range. If using a non-STP linear power supply, ensure that the unloaded voltage does not float above the drive's maximum input range.

2) For best performance, use the lowest voltage power supply that supplies the required speed and torque.

SureStep Drive / Motor Compatibility

Motor ⁽¹⁾⁽²⁾		Recommended Drive ⁽¹⁾			
Model # ⁽¹⁾⁽²⁾	Rated Amps Extension Cable ⁽²⁾	STP-DRV-4035 ⁽¹⁾	STP-DRV-4850 ⁽¹⁾	STP-DRV-6575 ⁽¹⁾	STP-DRV-80100 ⁽¹⁾
STP-MTR-17040(D)	1.7	✓	✓	✓	—
STP-MTR-17048(D)	2.0	✓	✓	✓	
STP-MTR-17060(D)	2.0	✓	✓	✓	
STP-MTR-23055(D)	2.8	✓	✓	✓	
STP-MTR-23079(D)	2.8	✓	✓	✓	
STP-MTR-34066(D)	2.8	✓	✓	✓	
STP-MTRH-23079(D)	5.6	—	—	✓	✓
STP-MTRH-34066(D)	6.3			✓	✓
STP-MTRH-34097(D)	6.3			✓	✓
STP-MTRH-34127(D)	6.3			✓	✓

1) The combinations above will perform according to the published speed/torque curves. However, any STP motor can be used with any STP drive. Using a motor with a current rating higher than the drive's output rating will proportionally limit the motor torque.

2) MTR motors have connectors compatible with the EXT extension cables. MTRH motors have connectors compatible with the EXTH extension cables.

SureStep[®] Stepping System Drives

SureStep[®] Microstepping Drives Overview

SureStep Series – Microstepping Drives Features Comparison					
Drive Model		Standard Microstepping Drives		Advanced Microstepping Drives	
		STP-DRV-6575	STP-DRV-4035	STP-DRV-4850	STP-DRV-80100
Price		\$89.00	\$155.00	\$215.00	\$265.00
Drive Type		Microstepping drive with pulse input		Advanced microstepping drive with pulse or analog input, serial communication; includes programming/communication cable STP-232RJ11-CBL	
		enclosed	open-frame	enclosed	
Output Current		1.0–7.5 A/phase	0.4–3.5 A/phase	0.1–5 A/phase	0.1–10 A/phase
Input Voltage		nominal: 24–65 VDC range: 20–75 VDC	nominal: 12–32 VDC range: 12–42 VDC	nominal: 24–48 VDC range: 18–53 VDC	nominal: 24–80 VDC range: 18–88 VDC
Configuration Method		rotary dial, dip switches, jumpers	dip switches	SureStep Pro software (included)	
Amplifier Type		MOSFET, dual H-bridge, 4-quadrant	MOSFET, dual H-bridge, bipolar chopper	MOSFET, dual H-bridge, 4-quadrant	
Current Control		4-state PWM @ 20 kHz	4-state PWM 20 kHz	4-state PWM @ 20 kHz	4-state PWM @ 20 kHz
Microstep Resolution		dipswitch selectable	dipswitch selectable	software selectable	software selectable
		200 to 20,000 steps/rev	400 to 10,000 steps/rev	200 to 51200 steps/rev	
Modes of Operation	Step & Dir	YES	YES	YES	YES
	CW/CCW	YES	n/a	YES	YES
	A/B Quad	n/a	n/a	YES	YES
	Oscillator	n/a	n/a	YES	YES
	Serial Indexing	n/a	n/a	YES	YES
Digital Input Signals	Step/Pulse	step & direction, CW/CCW step	step & direction	step & direction, CW/CCW step, A/B quadrature, run/stop & direction, jog CW/CCW, CW/CCW limits	
	Direction				
	Enable	motor disable	motor disable	motor enable, alarm reset, speed select (oscillator mode)	
Analog Input		n/a	n/a	speed control	
Output Signal		fault	n/a	fault, motion, tach	
Communication Interface		n/a	n/a	YES (programming/communication cable included)	
Non-volatile Memory Storage		n/a	n/a	YES	
Idle Current Reduction		YES	YES	YES	
Self Test		YES	YES	YES	
Additional Features		Load inertia (anti-resonance & damping feature to improve motor performance)	n/a	Anti-resonance (Electronic Damping) Auto setup Microstep emulation Torque ripple smoothing (allows for fine adjustment of phase in the range 0.25 to 1.5 rps) Waveform (command signal) smoothing	
		Step pulse noise filter			
Refer to Specifications Tables for detailed specifications					

Company
Information

Drives

Soft Starters

Motors

Power
TransmissionMotion: Servos
and Steppers

Motor Controls

Sensors:
ProximitySensors:
PhotoelectricSensors:
EncodersSensors:
Limit SwitchesSensors:
CurrentSensors:
PressureSensors:
TemperatureSensors:
LevelSensors:
Flow SwitchesPushbuttons
and Lights

Stacklights

Signal
Devices

Process

Relays and
TimersPneumatics:
Air PrepPneumatics:
Directional Control
ValvesPneumatics:
CylindersPneumatics:
TubingPneumatics:
Air FittingsAppendix
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SureStep® Stepping System Drives

SureStep® Standard Microstepping Drives



SureStep Series Specifications – Standard Microstepping Drives

Microstepping Drive		STP-DRV-6575	STP-DRV-4035
Drive Type		Microstepping drive with pulse input	Microstepping drive with pulse input
Output Current		Selectable from 1.0–7.5 A/phase (peak of sine)	Selectable from 0.4 to 3.5 A/phase (maximum output power is 140W)
Input Voltage (external p/s required)		Nominal: 24–65 VDC Range: 20–75 VDC	Nominal: 12–32 VDC Range: 12–42 VDC (including ripple voltage)
Configuration Method		Rotary dial, DIP switches, jumpers	DIP switches
Amplifier Type		MOSFET, dual H-bridge, 4-quadrant	MOSFET, dual H-bridge, bipolar chopper
Current Control		4-state PWM @ 20 kHz	4-state PWM @ 20 kHz
Protection		n/a	n/a
Recommended Input Fusing		Fuse: 7A fast-acting; ADC #ACG7; Holder: ADC # DN-F6L110	Fuse: 4A fast-acting; ADC # ACG4; Holder: ADC # DN-F6L110
Input Signals	Input Circuit	5–24 VDC nominal (range: 4–30 VDC); optically isolated, differential.	Opto-coupler input with 440 resistance (5 to 15 mA input current); Logic Low is input 0.8 VDC or less; Logic High is input 4VDC or higher.
	Step/Pulse	Minimum pulse width = 0.25 μ s. Maximum pulse frequency = 150 kHz or 2MHz (user selectable).	Motor steps on falling edge of pulse and minimum pulse width is 0.5 μ s (1MHz)
	Direction	FUNCTIONS: step & direction, CW/CCW step	Needs to change at least 2 microseconds before a step pulse is sent
	Enable	FUNCTION: disable motor when closed	Logic 1 will disable current to the motor (current is enabled with no hook-up or logic 0)
	Analog	n/a	n/a
Output Signal		30 VDC / 80 mA max, optically isolated photodarlington, sinking or sourcing. Function = closes on drive fault.	n/a
Features	Current Reduction	Reduce power consumption and heat generation by limiting motor running current to 100%, 90%, or 80% of maximum. Current should be increased to 120% if microstepping. (Torque is reduced/increased by the same %.)	n/a
	Idle Current Reduction	90% or 50% of running current. (Holding torque is reduced by the same %.)	0% or 50% reduction (idle current setting is active if motor is at rest for 1 second or more)
	Microstep Resolution	20000, 12800, 5000, 2000, 400 smooth, 400, 200 smooth, or 200 steps/rev.	400 (200x2), 1,000 (200x5), 2,000 (200x10), or 10,000 (200x50) steps/rev
	Phase Current Setting	(1.3–6.3) x 80%–120% DIP switch selectable	0.4 to 3.5 A/phase with 32 selectable levels
	Self Test	Automatically rotates the motor back and forth two turns in each direction in order to confirm that the motor is operational	Uses half-step to rotate 1/2 revolution in each direction at 100 steps/second
	Step Pulse Noise Filter	Select 150 kHz or 2MHz	n/a
	Load Inertia	Set motor and load inertia range to 0–4x or 5–10x.	n/a
Connectors		Removable screw terminal blocks. Motor & Power Supply: 30–12 AWG; Signals: 30–14 AWG	Screw terminal blocks with AWG 18 maximum wire size
Maximum Humidity		90% non-condensing	90% non-condensing
Storage/Ambient Temperature		0 to 50 °C [32 to 122 °F] (mount to suitable heat sink)	-20 to 80 °C [-4 to 176 °F]
Operating Temperature		0 to 85 °C [32 to 185 °F] (interior of electronics section)	0 to 55 °C [32 to 131 °F] recommended; 70 °C [158 °F] maximum
Drive Cooling Method		Natural convection (mount drive to metal surface)	Natural convection (mount drive to metal surface to dissipate heat)
Mounting		(2) #6 screws to mount wide or narrow side to metal surface	(4) #4 screws to mount on wide side; (2) #4 screws to mount on narrow side
Weight		10.8 oz [306g] – (including mating connectors)	9.3 oz. [264 g]
Agency Approvals		CE (EMC & LVD); RoHS	CE (complies with EN55011A & EN50082-1 (1992)), RoHS

SureStep® Stepping System Drives

SureStep® Advanced Microstepping Drives



SureStep Series Specifications – Advanced Microstepping Drives			
Microstepping Drive		STP-DRV-4850	STP-DRV-80100
Drive Type		Advanced microstepping drive with pulse or analog input, serial communication (serial communication allows indexing capability)	
Output Current		0.1-5.0 A/phase (in 0.01A increments)	0.1-10.0 A/phase (in 0.01A increments)
Input Voltage (external p/s required)		24-48 VDC (nominal) (range: 18-53 VDC)	24-80 VDC (nominal) (range: 18-88 VDC)
Configuration Method		SureStep Pro software (included)	
Amplifier Type		MOSFET, dual H-bridge, 4-quadrant	
Current Control		4-state PWM @ 20 kHz	
Protection		over-voltage, under-voltage, over-temperature, external output faults (phase-to-phase & phase-to-ground), inter-amplifier shorts	
Recommended Input Fusing		Fuse: 4A 3AG delay (ADC #MDL4) Fuse Holder: ADC #DN-F6L110	Fuse: 6.25A 3AG delay (ADC #MDL6-25) Fuse Holder: ADC #DN-F6L110
Input Signals	Input Circuit	Opto-coupler input with 5 to 15 mA input current; Logic Low is input 0.8 VDC or less; Logic High is input 4 VDC or higher.	
	Step/Pulse	optically isolated, differential, 5V, 330Ω; min pulse width = 250 ns max pulse frequency = 2MHz	
	Direction	adjustable bandwidth digital noise rejection feature FUNCTIONS: step & direction, CW/CCW step, A/B quadrature, run/stop & direction, jog CW/CCW, CW/CCW limits	
	Enable	Optically isolated, 5-12V, 680Ω; FUNCTIONS: motor enable, alarm reset, speed select (oscillator mode)	
	Analog	Range: 0–5 VDC; Resolution: 12 bit; FUNCTION: speed control	
Output Signal		Optically isolated, 24V, 10mA max; FUNCTIONS: fault, motion, tach	
Communication Interface		RS-232; RJ11 (6P4C) receptacle	
Non-volatile Memory Storage		Configurations are saved in FLASH memory on-board the DSP.	
Features	Idle Current Reduction	Reduction range of 0-90% of running current after delay selectable in ms	
	Microstep Resolution	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev	
	Modes of Operation	Step & direction, CW/CCW, A/B quadrature, oscillator, joystick, serial commands	
	Phase Current Setting	0.1-5.0 A/phase (in 0.01A increments)	0.1-10.0 A/phase (in 0.01A increments)
	Self Test	Checks internal & external power supply voltages, diagnoses open motor phases	
	Additional Features	Anti-resonance (Electronic Damping) Auto setup Microstep emulation Torque ripple smoothing (allows for fine adjustment of phase in the range 0.25 to 1.5 rps) Waveform (command signal) smoothing	
Connectors		Communication: RJ11 (6P4C); programming/communication cable STP-232RJ11-CBL included Other: removable screw terminal blocks; Motor & Power Supply: 26–12 AWG; Signals: 28–16 AWG	
Maximum Humidity		90% non-condensing	
Storage Temperature		-20 to 80 °C [-4 to 176 °F]	
Operating Temperature		0 to 55 °C [32 to 131 °F]; (mount to suitable heat sink)	
Drive Cooling Method		Natural convection (mount to suitable heat sink)	
Mounting		#6 mounting screws (mount to suitable heat sink)	
Weight		8 oz [227g] (approximate)	
Agency Approvals		CE, RoHS	

Company
Information

Drives

Soft Starters

Motors

Power
TransmissionMotion: Servos
and Steppers

Motor Controls

Sensors:
ProximitySensors:
PhotoelectricSensors:
EncodersSensors:
Limit SwitchesSensors:
CurrentSensors:
PressureSensors:
TemperatureSensors:
LevelSensors:
Flow SwitchesPushbuttons
and Lights

Stacklights

Signal
Devices

Process

Relays and
TimersPneumatics:
Air PrepPneumatics:
Directional Control
ValvesPneumatics:
CylindersPneumatics:
TubingPneumatics:
Air FittingsAppendix
Book 2Terms and
Conditions

SureStep® Stepping System Drives

SureStep® Microstepping Drives Accessories

Braking Accessories

If you plan to use a regulated or switching power supply, you might encounter problems from regeneration. As a load rapidly decelerates from a high speed, much of the kinetic energy of that load is transferred back to the motor. This energy is then pushed back to the drive and power supply, resulting in increased system voltage. If there is enough overhauling load on the motor, the DC voltage will go above the drive and/or power supply limits.

This can trip the overvoltage protection of a switching power supply or a drive, and cause it to shut down.

To solve this problem, AutomationDirect offers a regeneration clamp and a braking resistor as optional accessories. The regen clamp has a built-in 50W braking resistor. For additional braking power (larger overhauling loads), an optional 100W braking resistor is also available.

Regeneration Clamp Description

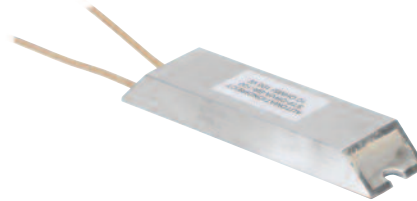
As with most stepper systems, a clamp circuit is often required to limit increased power supply bus voltage when the motor is decelerating under load. This is commonly referred to as “regeneration,” which is what happens when DC motors are driven by their load. During regeneration, the DC motor can produce enough voltage to actually exceed the input power supply voltage.

With a Regen Clamp, one or more stepper drives can be protected from “Over Voltage” conditions by placing the clamp module between the power supply and the drive. The clamp tracks the input power supply, and will operate from 24 to 80 volts. No adjustments are needed.

The Regen Clamp is designed to handle a wide range of conditions. The voltage input matches the needs of the SureStep stepper drives by providing 24 to 80 VDC capabilities, and external power resistors can be added for even greater continuous power requirements. The clamp modules are small and compact to minimize impact on the system design. More than one stepper drive can be connected to the clamp module with the potential to handle an entire multi-axis system.



Regeneration Clamp



Braking Resistor

Regeneration Clamp Features

- Built-in 50W power resistor for more continuous current handling (optional 100W resistor is also available)
- Mounted on a heat sink
- Voltage range: 24–80 VDC; no user adjustments required
- Power: 50W continuous; 800W peak
- Wire connection: 6-pin screw terminal block; 12–18 AWG wire.
- Indicators (LED):
Green = power supply voltage is present
Red = clamp is operating (usually when stepper is decelerating)
- Protection: The external power supply is internally connected to an “Input Diode” in the regen clamp that protects the power supply from high regeneration voltages. This diode protects the system from connecting the power supply in reverse. If the clamp circuit fails, the diode will continue to protect the power supply from over-voltage.
- RoHS

SureStep Series Specifications – Microstepping Drives Optional Accessories		
Part Number	Price	Description
STP-DRVA-RC-050 *	\$99.00	Regen Clamp: use with DC-powered stepper & servo drives; 50W, 24–80 VDC
STP-DRVA-BR-100	\$49.00	Braking Resistor: use with STP-DRV-RC-050 regen clamp; 100W, 10 ohms
* Do not use the regeneration clamp in an atmosphere containing corrosive gases.		

SureStep® Stepping System Drives

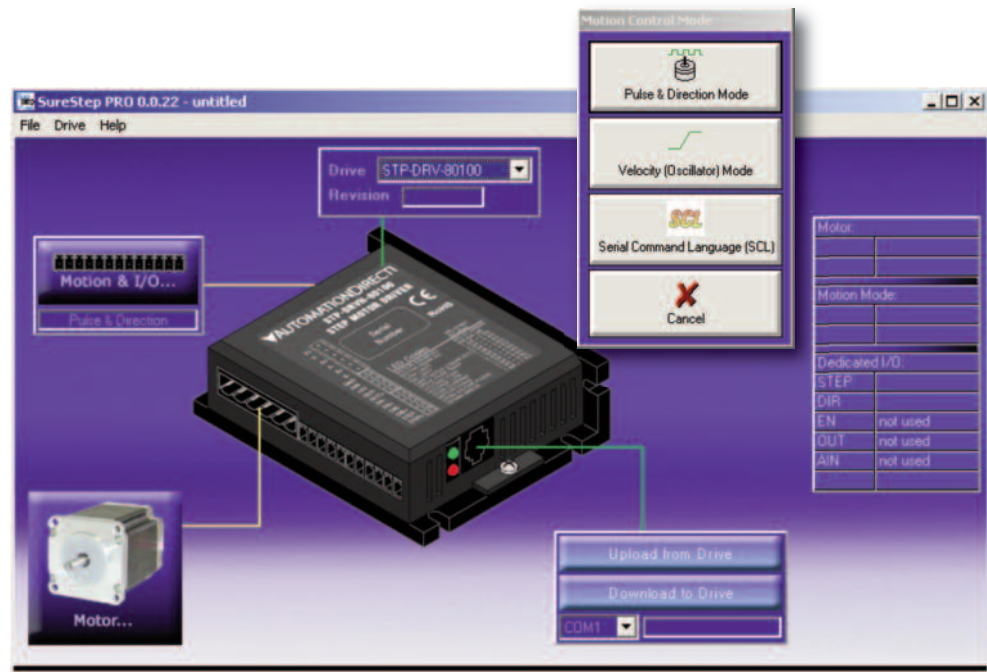
SureStep® Microstepping Drives Accessories

SureStep Pro Drive Configuration Software - for Advanced Stepper Drives

Free Download

SureStep Pro configuration software is available as a free download from our website for SureStep advanced drives (STP-DRV-4850 & -80100).

- Used for easy configuration and setup of the drive, including drive, motion control mode, I/O, motor.
- Serial command language for motor drive control via serial port; eliminates the need for separate motion controllers or indexers; provides easy interface to other industrial devices such as PCs, PLCs and HMIs.
- Easily use the ASCII output commands from most of our PLCs to enable indexing capability.
- Help files include technical data, application information, advanced setup, serial command instructions.
- Runs on 32-bit/64-bit Windows 7 and XP operating systems.



SureStep Drive Configuration Software - for Advanced Stepper Drives

Part Number	Price	Description
STP-PRO *	\$9.00	Windows-based configuration software for use with SureStep STP-DRV-4850 and STP-DRV-80100 advanced stepper drives. Requires Windows XP or Windows 7 (32 or 64-bit) operating system, minimum 12MB hard drive space, and RS-232 port (software also compatible with USB-RS232 adapter).

* Available for purchase on CD or can be downloaded for free from AutomationDirect Web site (www.AutomationDirect.com).

Company Information

Drives

Soft Starters

Motors

Power Transmission

Motion: Servos and Steppers

Motor Controls

Sensors: Proximity

Sensors: Photoelectric

Sensors: Encoders

Sensors: Limit Switches

Sensors: Current

Sensors: Pressure

Sensors: Temperature

Sensors: Level

Sensors: Flow Switches

Pushbuttons and Lights

Stacklights

Signal Devices

Process

Relays and Timers

Pneumatics: Air Prep

Pneumatics: Directional Control Valves

Pneumatics: Cylinders

Pneumatics: Tubing

Pneumatics: Air Fittings

Appendix Book 2

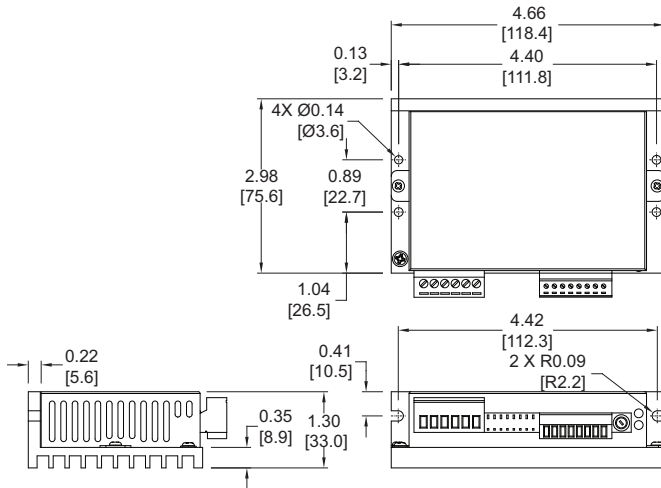
Terms and Conditions

SureStep® Stepping System Drives

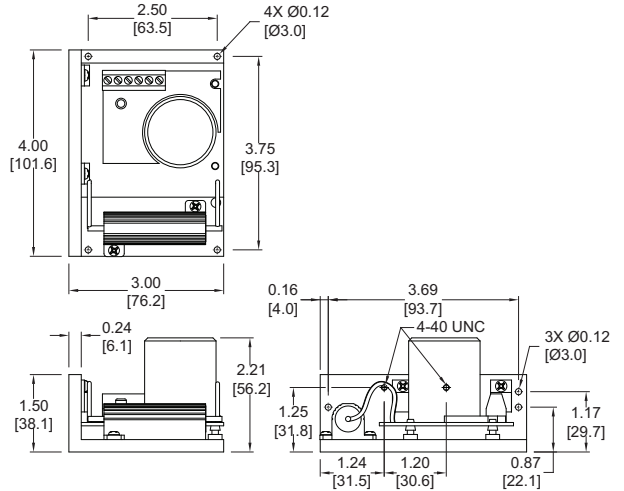
SureStep® Microstepping Drives Dimensions

Dimensions = in [mm]

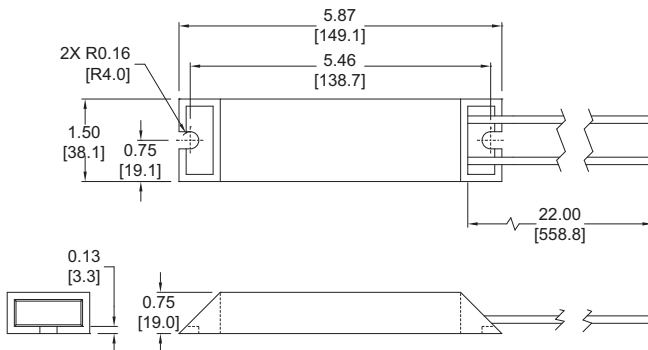
STP-DRV-6575



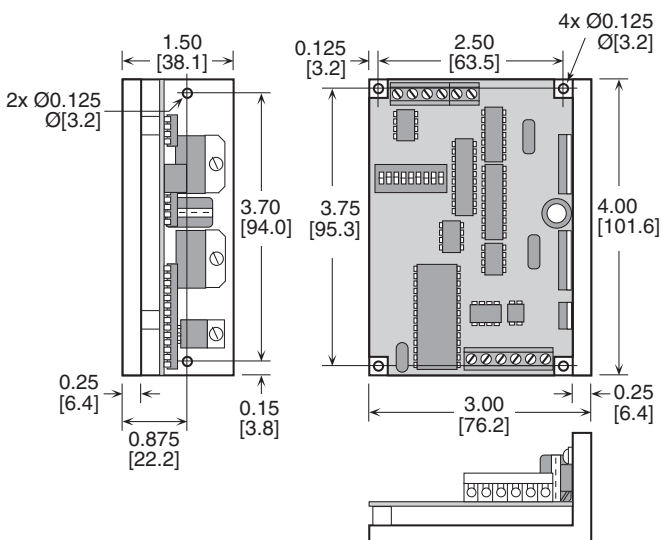
STP-DRVA-RC-050



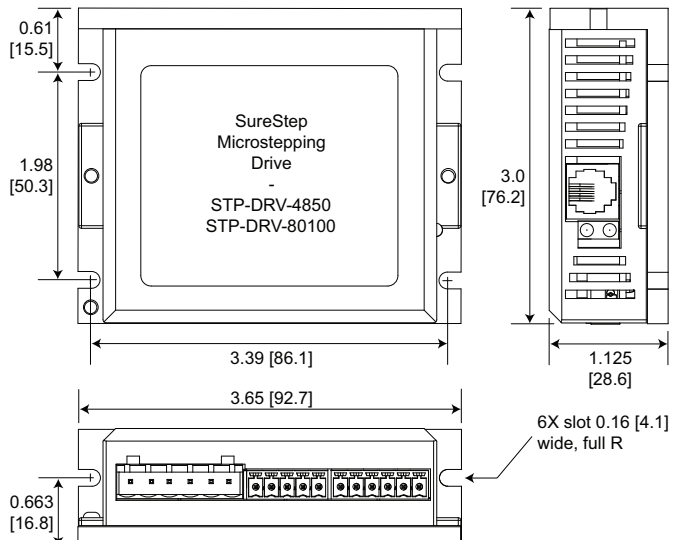
STP-DRVA-BR-100



STP-DRV-4035



STP-DRV-4850 & -80100





If it's in your cabinet, it's online at:
www.AutomationDirect.com
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Starting with the enclosure, we carry everything you need to build an electrical control system, right down to the wire and tools. And we have the devices that go in the panel, such as logic controllers, HMI, drives, relays, and motor controls. If you're maintaining existing systems, we've got great prices on MRO parts such as circuit breakers, fuses, motors, pneumatics and pilot devices. In addition to our catalog all our products are available to
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See Web site or catalog Terms and Conditions for all details and exceptions.

SureStep® Stepping System Motors

SureStep® Stepping Motors

SureStep Series Part Numbers – Connectorized Bipolar Stepping Motors

Bipolar Stepping Motors	High Torque Motors												Higher Torque Motors							
	STP-MTR-17040	STP-MTR-17040D	STP-MTR-17048	STP-MTR-17048D	STP-MTR-17060	STP-MTR-17060D	STP-MTR-23055	STP-MTR-23055D	STP-MTR-23079	STP-MTR-23079D	STP-MTR-34066	STP-MTR-34066D	STP-MTRH-23079	STP-MTRH-23079D	STP-MTRH-34066	STP-MTRH-34066D	STP-MTRH-34097	STP-MTRH-34097D	STP-MTRH-34127	STP-MTRH-34127D
Price	\$18.00	\$22.00	\$22.00	\$26.00	\$35.50	\$39.50	\$35.50	\$40.00	\$46.50	\$51.00	\$111.00	\$126.00	\$51.50	\$56.00	\$124.00	\$139.00	\$140.00	\$155.00	\$167.00	\$167.00
Shaft Type	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual

SureStep Series Specifications – Connectorized Bipolar Stepping Motors

Bipolar Stepping Motors		High Torque Motors						Higher Torque Motors			
		STP-MTR-17040(D)	STP-MTR-17048(D)	STP-MTR-17060(D)	STP-MTR-23055(D)	STP-MTR-23079(D)	STP-MTR-34066(D)	STP-MTRH-23079(D)	STP-MTRH-34066(D)	STP-MTRH-34097(D)	STP-MTRH-34127(D)
NEMA Frame Size		17	17	17	23	23	34	23	34	34	34
* Maximum Holding Torque	(lb-in)	3.81	5.19	7.19	10.37	17.25	27.12	17.87	27.12	50.00	80.50
	(oz-in)	61	83	115	166	276	434	286	434	800	1288
	(N-m)	0.43	0.59	0.81	1.17	1.95	3.06	2.02	3.06	5.65	9.12
Rotor Inertia	(oz-in ²)	0.28	0.37	0.56	1.46	2.60	7.66	2.60	7.66	14.80	21.90
	(kg-cm ²)	0.05	0.07	0.10	0.27	0.48	1.40	0.48	1.40	2.71	4.01
Rated Current (A/phase)		1.7	2.0	2.0	2.8	2.8	2.8	5.6	6.3	6.3	6.3
Resistance (Ω/phase)		1.6	1.4	2.0	0.8	1.1	1.1	0.4	0.3	0.3	0.5
Inductance (mH/phase)		3.0	2.7	3.3	2.4	3.8	6.6	1.2	1.5	2.1	4.1
Insulation Class		130°C [266°F] Class B; 300V rms									
Basic Step Angle		1.8°									
Shaft Runout (in)		0.002 in [0.051 mm]									
Max Shaft Radial Play @ 1lb load		0.001 in [0.025 mm]									
Perpendicularity		0.003 in [0.076 mm]									
Concentricity		0.002 in [0.051 mm]									
* Maximum Radial Load (lb [kg])		6.0 [2.7]			15.0 [6.8]		39.0 [17.7]	15.0 [6.8]	39.0 [17.7]		
* Maximum Thrust Load (lb [kg])		6.0 [2.7]			13.0 [5.9]		25.0 [11.3]	13.0 [5.9]	25.0 [11.3]		
Storage Temperature Range		-20°C to 100°C [-4°F to 212°F]									
Operating Temperature Range		-20°C to 50°C [-4°F to 122°F] (motor case temperature should be kept below 100°C [212 °F])									
Operating Humidity Range		55% to 85% non-condensing									
Product Material		steel motor case; stainless steel shaft(s)									
Environmental Rating		IP40									
Weight (lb [kg])		0.6 [0.3]	0.7 [0.3]	0.9 [0.4]	1.5 [0.7]	2.2 [1.0]	3.9 [1.7]	2.4 [1.1]	3.9 [1.7]	5.9 [2.7]	8.4 [3.8]
Agency Approvals		CE (complies with EN55014-1 (1993) and EN60034-1.5.11)									
Design Tips		Allow sufficient time to accelerate the load and size the step motor with a 100% torque safety factor. DO NOT disassemble step motors because motor performance will be reduced and the warranty will be voided. DO NOT connect or disconnect the step motor during operation. Mount the motor to a surface with good thermal conductivity, such as steel or aluminum, to allow heat dissipation. Use a flexible coupling with "clamp-on" connections to both the motor shaft and the load shaft to prevent radial and thrust loading on bearings from minor misalignment.									
Accessory Extension Cable		STP-EXT-020						STP-EXTH-020			
* For dual-shaft motors (STP-MTR-xxxxxD): The sum of the front and rear Torque Loads, Radial Loads, and Thrust Loads must not exceed the applicable Torque, Radial, and Thrust load ratings of the motor.											

* For dual-shaft motors (STP-MTR-xxxxxD):

The sum of the front and rear Torque Loads, Radial Loads, and Thrust Loads must not exceed the applicable Torque, Radial, and Thrust load ratings of the motor.

SureStep® Stepping Motors Mounting Accessory

Mounting Accessory – for NEMA 17 SureStep Series Bipolar Stepping Motors

Part Number	Price	Description
STP-MTRA-RB-85	\$8.00	Reducer bushing, 8mm OD to 5mm ID, 16mm length, aluminum alloy. Connects NEMA size 17 stepper motors to Koyo TRD-NH and TRD-SH hollow shaft encoders.

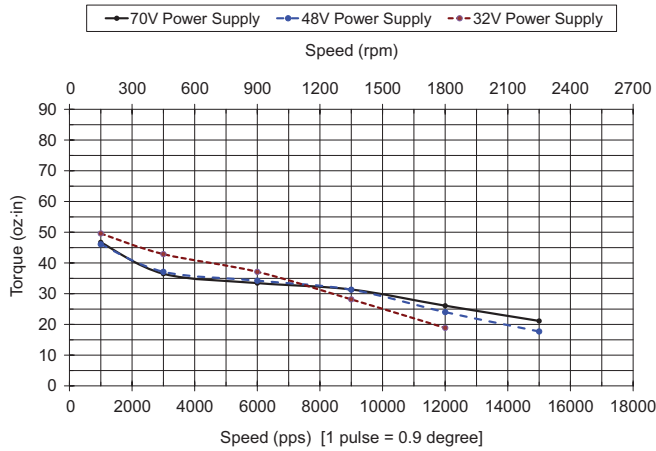
Surestep® Stepping System Motors

SureStep® Motor Torque vs. Speed Charts

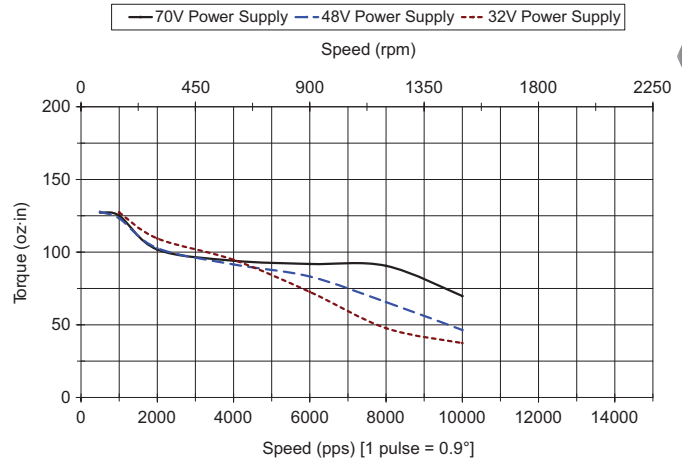
STP-MTR-17xxx(D) NEMA 17 Step Motors

STP-MTR(H)-23xxx(D) NEMA 23 Step Motors

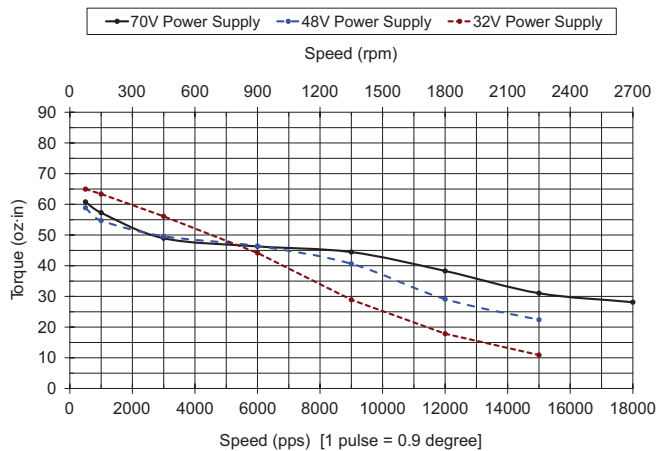
STP-MTR-17040(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



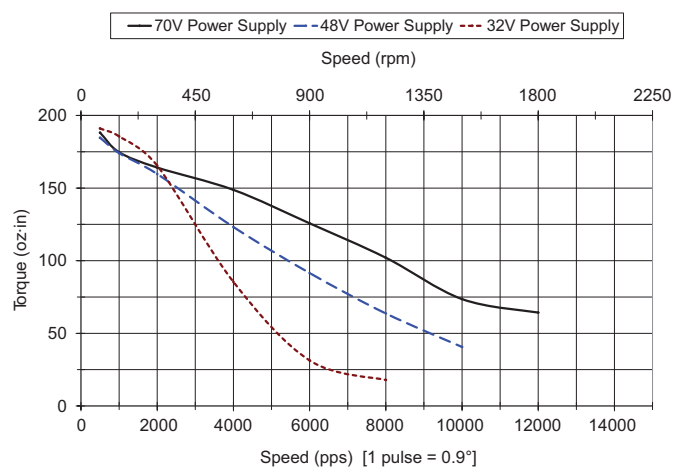
STP-MTR-23055(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



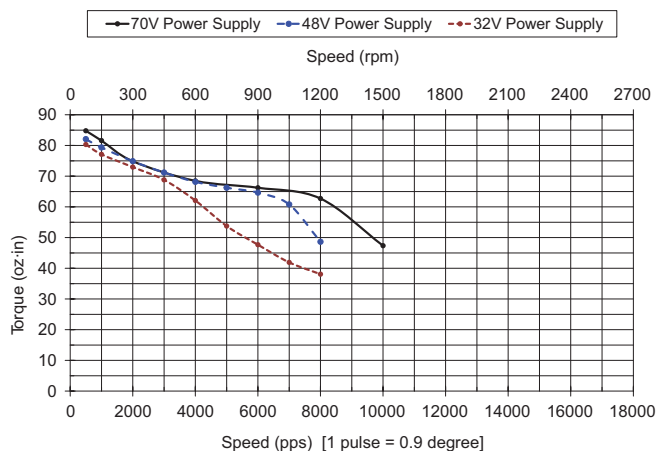
STP-MTR-17048(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



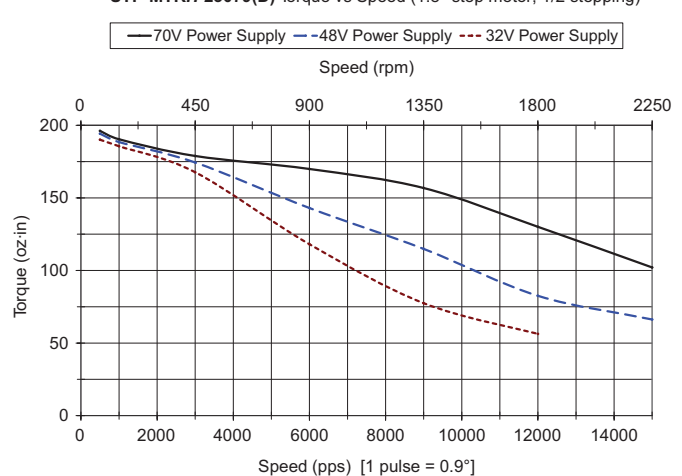
STP-MTR-23079(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



STP-MTR-17060(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



STP-MTRH-23079(D) Torque vs Speed (1.8° step motor; 1/2 stepping)

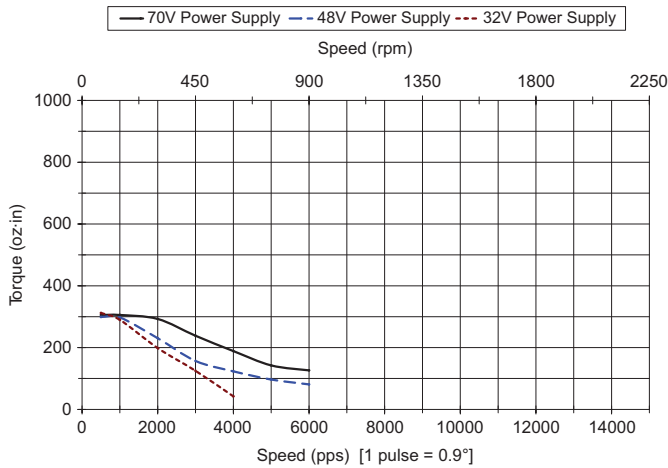


SureStep® Stepping System Motors

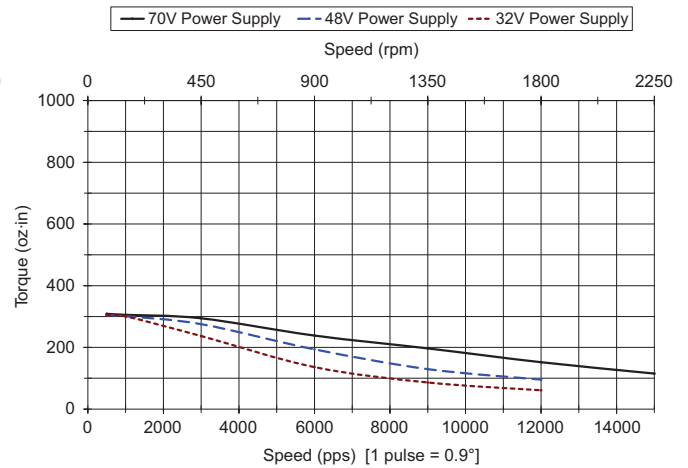
SureStep® Motor Torque vs. Speed Charts (continued)

STP-MTR(H)-34xxx(D) NEMA 34 Step Motors

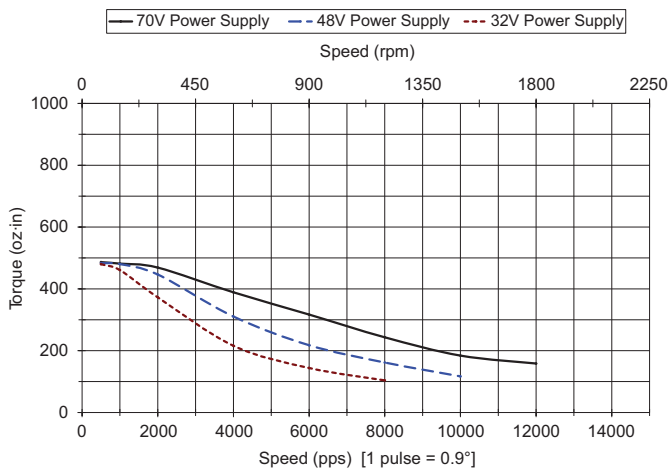
STP-MTR-34066(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



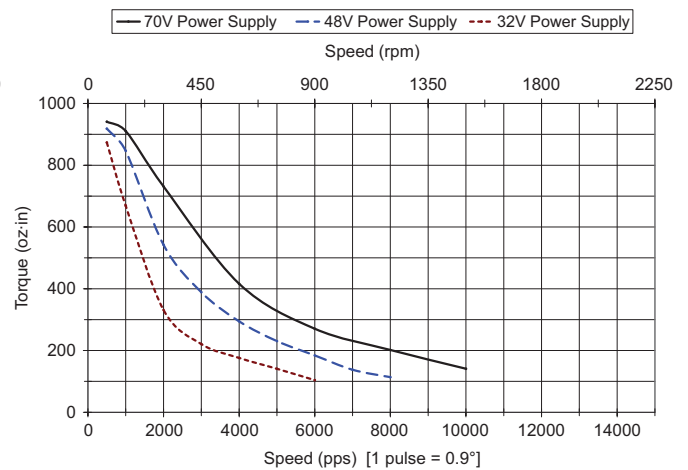
STP-MTRH-34066(D) Torque vs Speed (1.8° motor; 1/2 stepping)



STP-MTRH-34097(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



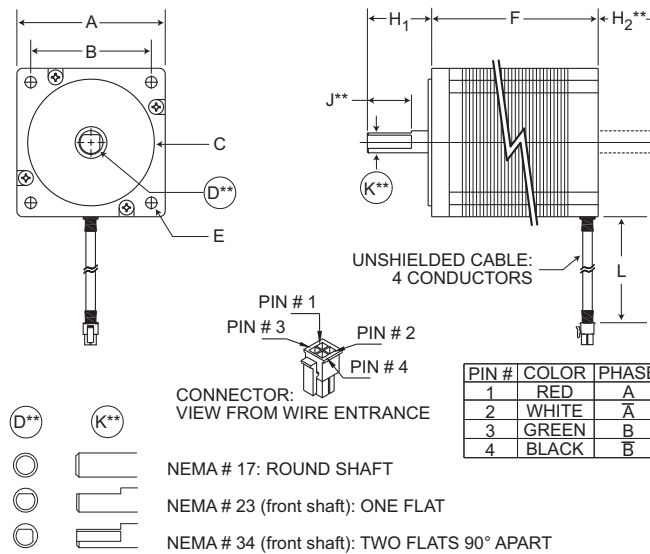
STP-MTRH-34127(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



SureStep® Stepping System Motors

SureStep® Motor Dimensions and Cabling

STP-MTR(H)-xxxx(D) Motors



** Dimension H_2 applies only to dual-shaft STP-xxxxD motors.

** Dimension D is the same for both front and rear shafts of dual-shaft motors.

** Dimensions J & K do NOT apply to rear shafts of dual-shaft motors (all rear shafts are round style).

SureStep Series Dimensions & Cabling – Connectorized Bipolar Stepping Motors

Dimen- sions* (in [mm])*	High Torque Motors						Higher Torque Motors			
	STP-MTR -17040(D)	STP-MTR -17048(D)	STP-MTR -17060(D)	STP-MTR -23055(D)	STP-MTR -23079(D)	STP-MTR -34066(D)	STP-MTRH -23079(D)	STP-MTRH -34066(D)	STP-MTRH -34097(D)	STP-MTRH -34127(D)
A	1.67 [42.3]			2.25 [57.2]		3.39 [86.1]	2.25 [57.2]	3.39 [86.1]		
B	1.22 [31.0]			1.86 [47.2]		2.74 [69.6]	1.86 [47.2]	2.74 [69.6]		
C	Ø 0.87 [22.1]			Ø 1.50 [38.1]		Ø 2.88 [73.0]	Ø 1.50 [38.1]	Ø 2.88 [73.0]		
D**	Ø 0.20 [5.0]			Ø 0.25 [6.4]		Ø 0.50 [12.7]	Ø 0.25 [6.4]	Ø 0.50 [12.7]		
E	M3 x 0.5 thread 0.15 [3.8] min depth			Ø 0.20 [5.1] through		Ø 0.26 [6.6] through	Ø 0.20 [5.1] through	Ø 0.26 [6.6] through		
F	1.58 [40.1]	1.89 [48.0]	2.34 [59.5]	2.22 [56.4]	3.10 [78.7]	2.64 [67.1]	3.10 [78.7]	2.64 [67.1]	3.82 [97.0]	5.00 [127.0]
H ₁	0.94 [24.0]			0.81 [20.6]		1.46 [37.1]	0.81 [20.6]	1.46 [37.1]		
H ₂ **	0.39 [9.9]			0.63 [16.0]		1.13 [28.7]	0.63 [16.0]	1.13 [28.7]		
J**	n/a			0.59 [15.0]		0.98 [25.0]	0.59 [15.0]	0.98 [25.0]		
K**	n/a			0.23 [5.8]		0.45 [11.4]	0.23 [5.8]	0.45 [11.4]		
L	12.0 [305]						12 [305]			
Conductor	(4) #20 AWG						(4) #18 AWG			
Connector	Molex # 43025-0400						Molex # 39-01-3042			
Pin	Molex # 43030-0007						Molex # 39-00-0039			

* mm dimensions are for reference purposes only.

** Dimension H_2 applies only to dual-shaft STP-xxxxD motors.

Dimension D (shaft diameter) is the same for both front and rear shafts of dual-shaft motors.

Dimensions J & K do NOT apply to rear shafts of dual-shaft motors (all rear shafts are round style).

SureStep® Stepping System Cables

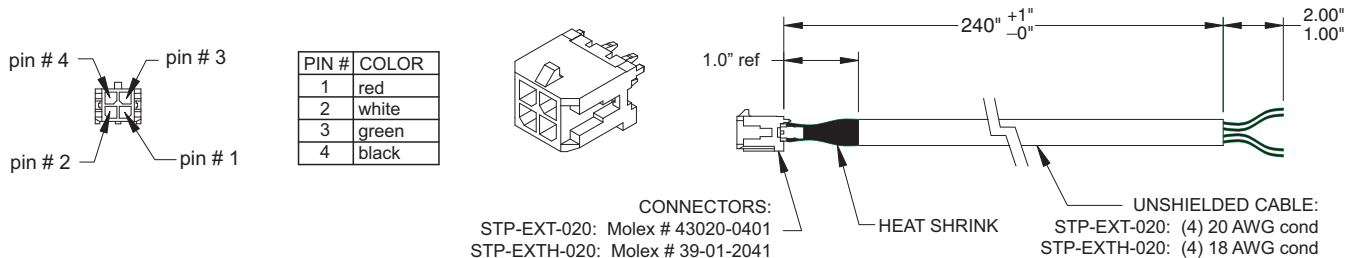
SureStep® Cables

SureStep Series – Stepping System Cables					
Cable	Price	Purpose	Length	Use With	Cable End Connectors
STP-EXT-020	\$15.00	motor to drive extension	20 ft	STP-MTR-xxxx(D)	pigtail / Molex 43020-0401 connector
STP-EXTH-020	\$30.00	motor to drive extension	20 ft	STP-MTRH-xxxx(D)	pigtail / Molex 39-01-2041 connector
STP-232RJ11-CBL *	\$9.00	programming/communication	10 ft	STP-DRV-4850 STP-DRV-80100	DB9 female / RJ11(6P4C)
STP-232HD15-CBL-2 **	\$10.00	communication	6.6 ft	STP-DRV-4850 STP-DRV-80100	HD 15-pin male / RJ12 6-pin plug
STP-232RJ12-CBL-2 **	\$5.50	communication	6.6 ft	STP-DRV-4850 STP-DRV-80100	RJ12 6-pin plug / RJ12 6-pin plug

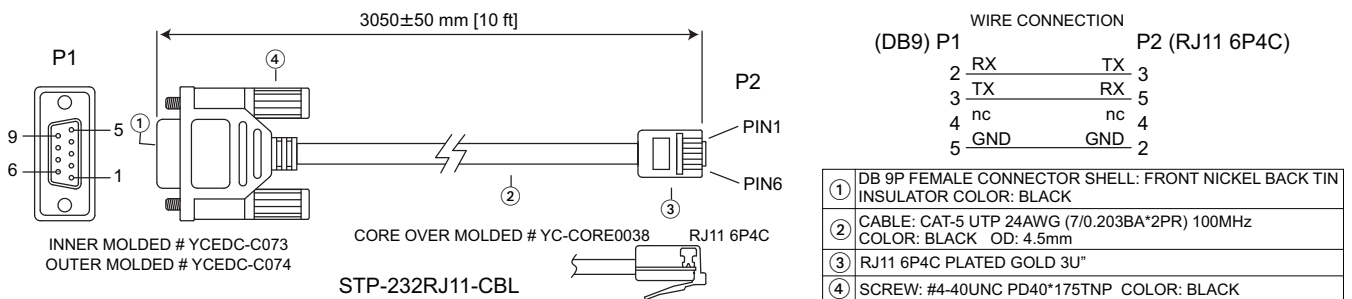
** Programming/communication cable STP-232RJ11-CBL is available for spare or replacement purposes.
(One cable is included with each software programmable drive.)*

*** Refer to the ZIPLinks Wiring Solutions section for complete information regarding cables STP-232HD15-CBL-2 and STP-232RJ12-CBL-2.*

Extension Cable Wiring Diagram



Programming Cable Wiring Diagram



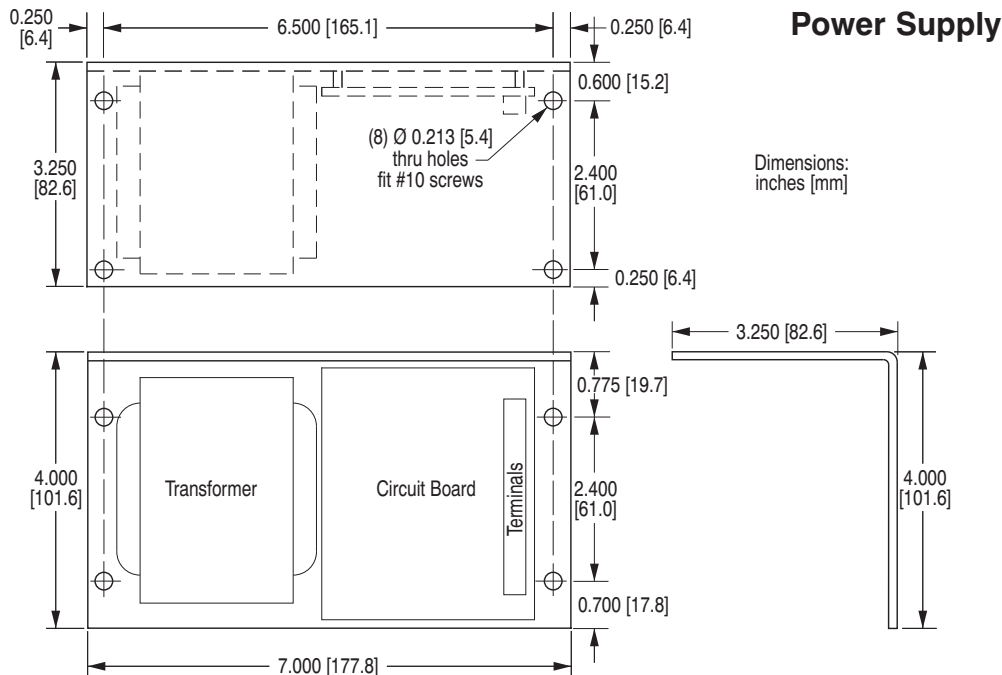
SureStep® Stepping System Power Supplies

SureStep® Power Supplies

SureStep Series Specifications – Stepping System Power Supplies				
Power Supply	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005
Price	\$120.00	\$140.00	\$178.00	\$178.00
Input Power (fuse protected *)	1-phase, 120/240 VAC, 50/60 Hz, 150 VA Fuse*: 3A	1-phase, 120/240 VAC, 50/60 Hz, 350 VA Fuse*: 5A	1-phase, 120/240 VAC, 50/60 Hz, 650 VA Fuse*: 8A	1-phase, 120/240 VAC, 50/60 Hz, 500 VA Fuse*: 7A
Input Voltage Range (switch selectable)	120/240 VAC ±10% (Voltage range switch is set to 240 VAC from factory)			
Inrush Current	120 VAC < 12 A / 240 VAC < 14 A	120 VAC < 20A / 240 VAC < 24A	120 VAC < 40A / 240 VAC < 50A	
Motor Supply Output (linear unregulated, fuse protected *, and power on LED indicator)	32 VDC @ 4A (fully loaded) 35 VDC @ 1A load 41 VDC @ no load Fuse*: 6A (Electrically isolated from Logic Supply Output)	46.5 VDC @ 5A (fully loaded) 52 VDC @ 1A load 57.5 VDC @ no load Fuse*: 8A	46.5 VDC @ 10A (fully loaded) 50 VDC @ 1A load 57.5 VDC @ no load Fuse*: 15A	70 VDC @ 5A (fully loaded) 79 VDC @ 1A load 86.5 VDC @ no load Fuse*: 8A
Logic Supply Output (regulated and power on LED indicator)	5 VDC ±5% @ 500 mA (Electronically Overload Protected) (Electrically isolated from Motor Supply Output)			
Watt Loss	13W	25W	51W	42W
Storage Temperature Range	-55 to 85 °C [-67 to 185 °F]			
Operating Temperature Range	0 to 50 °C [32 to 122 °F] full rated; derate current 1.1% per degree above 50°C; 70 °C [158 °F] maximum			
Humidity	95% (non-condensing) relative humidity maximum			
Cooling Method	Natural convection (mount power supply to metal surface if possible)			
Dimensions (in [mm])	4.00 x 7.00 x 3.25 [101.6 x 177.8 x 82.6]	5.00 x 8.10 x 3.88 [127.0 x 205.7 x 98.6]	5.62 x 9.00 x 4.62 [142.7 x 228.6 x 117.3]	
Mounting	Mount on either wide or narrow side with machine screws per dimension diagrams			
Weight (lb [kg])	6.5 [2.9]	11 [4.9]	18 [8.3]	16 [7.2]
Connections	Screw Terminals			
Agency Approvals	UL (file # E181899), CSA, CE			
* Fuses to be replaced by qualified service personnel only. Use (1-1/4 x 1/4 in) ceramic fast-acting fuses (Edison type ABC from AutomationDirect, or equivalent).				

* Fuses to be replaced by qualified service personnel only. Use (1-1/4 x 1/4 in) ceramic fast-acting fuses (Edison type ABC from AutomationDirect, or equivalent).

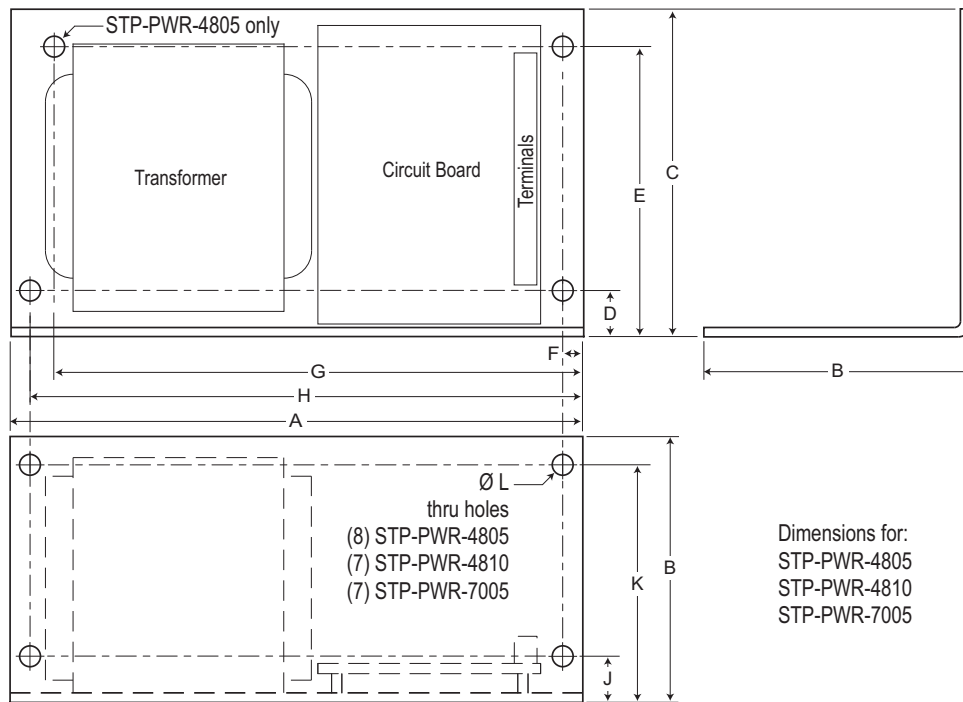
Power Supply Dimensions



SureStep® Stepping System Power Supplies

SureStep® Power Supply Dimensions (continued)

STP-PWR-4805, -4810, -7005 Power Supplies



SureStep Series Dimensions – 48V & 70V Power Supplies

Power Supply Part Number	Dimensions* (in [mm]*)											Mtg Screw
	A	B	C	D	E	F	G	H	J	K	L	
STP-PWR-4805	8.10 [205.7]	3.88 [98.6]	5.00 [127.0]	0.87 [22.1]	4.67 [118.6]	0.25 [6.4]	7.15 [181.6]	7.75 [196.9]	0.50 [12.7]	3.53 [89.7]	0.200 [5.1]	#10
STP-PWR-4810 STP-PWR-7005	9.00 [228.6]	4.62 [117.3]	5.62 [142.7]	1.56 [39.6]	4.06 [103.1]	0.35 [8.9]	n/a	8.59 [218.2]	0.50 [12.7]	4.27 [108.5]	9/32 [7.1]	1/4

* mm dimensions are for reference purposes only.

SureStep® Stepping Systems with PLCs

Controller Compatibility

Motion Control with AutomationDirect PLCs* and SureStep® Stepping Systems			
PLC Series	Starting at \$198.00	Starting at \$125.00	Starting at \$251.00
	1 axis control**	1-2 axis control***	1-5 axis control***
	DL105	DL05*	DL06*
Built-In PLC Pulse Outputs	1 axis pulse output included with the PLC base unit.		
Maximum Pulse Rate Output	7,000 pulses/sec		10,000 pulses/sec
Target Pulse Range	-8,388,608 to +8,388,607 pulses		
Minimum Velocity	40 pulses/sec		
Velocity Resolution	10 pulses/sec		
Accel/Decel Range	0.1 to 10 sec		
Position Control	Trapezoidal Profiles		
Velocity Control	Velocity Levels		
I/O Modules Pulse Outputs	Not Applicable for DL105	H0-CTRIO (1 axis per module)	
Maximum Pulse Rate Output		25,000 pulses/sec	
Target Pulse Range		+ / - 2.1 billion pulses (31 bits plus sign)	
Minimum Velocity		40 pulses/sec	
Velocity Resolution		10 pulses/sec	
Accel/Decel Range		0.1 to 10 sec	
Position Control		Trapezoidal Profiles (linear & S-curve ramps)	
Velocity Control		Dynamic Velocity (controlled accel/decel)	
Maximum Number of Modules		1	4
* Any AutomationDirect PLC capable of RS-232 ASCII communication can write serial commands to the SureStep Advanced Microstepping Drives (STP-DRV-4850 & -80100). These PLCs include DirectLOGIC series DL 05, 06, 250-1, 260, 350, & 450, as well as CLICK, Do-more and P3000 series. However, we strongly recommend using DL06, DL260, Do-more, CLICK, or Productivity3000 PLCs for serial commands due to their more advanced ASCII instruction set which includes PRINTV and VPRINT commands.			
** When using DC output models only. *** When using either DC output model or H0-CTRIO option module.			

Motion Control with AutomationDirect PLCs* and <i>SureStep™</i> Stepping Systems				
1-16 axis control depending on base size and power supply budget **				
PLC Series	CPUs starting at \$230.00			CPUs starting at \$299.00
	DL205*			Do-more
I/O Modules Pulse Outputs	D2-CTRINT (1 axis per module)	H2-CTRIO (2 axes)	T1H-CTRIO (2 axes per module)	H2-CTRIO2 (2 axes)
<i>Maximum Pulse Rate Output</i>	5,000 pulses/sec	25,000 pulses/sec	25,000 pulses/sec	250,000 pulses/sec
<i>Target Pulse Range</i>	-8,388,608 to +8,388,607 pulse + / - 2.1 billion pulses			
<i>Minimum Velocity</i>	40 pulses/sec	25 pulses/sec		
<i>Velocity Resolution</i>	10 pulses/sec	1 pulse/sec		
<i>Accel/Decel Range</i>	0.1 to 10 sec			
<i>Position Control</i>	Trapezoidal Profiles (linear and S-curve ramps)			
<i>Velocity Control</i>	Dynamic Velocity (controlled accel/decel)			
<i>Maximum Number of Modules</i>	1	1-8		

* Any AutomationDirect PLC capable of RS-232 ASCII communication can write serial commands to the SureStep *Advanced* Microstepping Drives (STP-DRV-4850 & -80100). These PLCs include DirectLOGIC series DL 05, 06, 250-1, 260, 350, & 450, as well as CLICK, Do-more and P3000 series. However, we strongly recommend using DL06, DL260, Do-more, CLICK, or Productivity3000 PLCs for serial commands due to their more advanced ASCII instruction set which includes PRINTV and VPRINT commands. ** Using D2-CTRINT or Hx-CTRIO modules.

SureStep® Stepping Systems with PLCs

Controller Compatibility (continued)

Motion Control with PC-based Control and <i>SureStep</i> ® Stepping Systems			
1–16 axis control depending on base size and power supply budget *			
Controller Series	PC-based motion control with Think & Do on your Windows PC or our embedded WinPLC		
I/O Modules Pulse Outputs	H2-CTRIO (2 axes per module)	T1H-CTRIO (2 axes per module)	H2-CTRIO2 (2 axes)
<i>Maximum Pulse Rate Output</i>	25,000 pulses/sec	25,000 pulses/sec	250,000 pulses/sec
<i>Target Pulse Range</i>	+ / - 2.1 billion pulses		
<i>Minimum Velocity</i>	25 pulses/sec		
<i>Velocity Resolution</i>	1 pulse/sec		
<i>Accel/Decel Range</i>	0.1 to 10 sec		
<i>Position Control</i>	Trapezoidal Profiles (linear and S-curve ramps)		
<i>Velocity Control</i>	Dynamic Velocity (controlled accel/decel)		
<i>Maximum Number of Modules</i>	1-8		
<i>* Using Hx-CTRIO modules</i>			

NEMA Planetary Gearboxes

The SureGear PGCN series easily mates to SureStep motors, and other NEMA frame motors. Everything you need to mount your SureStep motor is included!

It is the perfect solution for applications such as material handling, pick and place, automation, packaging, and other motion control applications requiring a NEMA input/output interface.

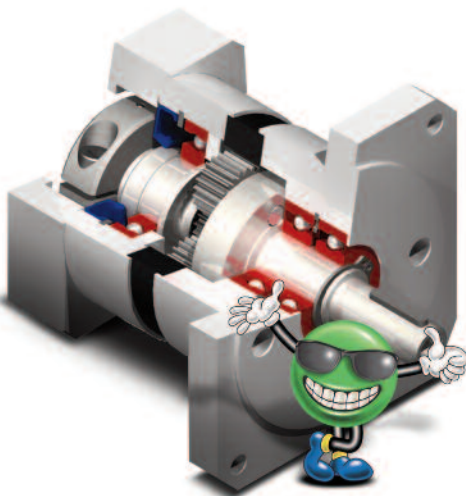


Precision Gearboxes for Stepper Motors

**15 models,
five gear ratios
available in
NEMA 17, 23
and 34 frame sizes**



**Tough on the outside,
precision quality on
the inside**



Sure  **gear®**



Company
Information

Drives

Soft Starters

Motors

Power
Transmission

Motion: Servos
and Steppers

Motor Controls

Sensors:
Proximity

Sensors:
Photoelectric

Sensors:
Encoders

Sensors:
Limit Switches

Sensors:
Current

Sensors:
Pressure

Sensors:
Temperature

Sensors:
Level

Sensors:
Flow Switches

Pushbuttons
and Lights

Stacklights

Signal
Devices

Process

Relays and
Timers

Pneumatics:
Air Prep

Pneumatics:
Directional Control
Valves

Pneumatics:
Cylinders

Pneumatics:
Tubing

Pneumatics:
Air Fittings

Appendix
Book 2

Terms and
Conditions



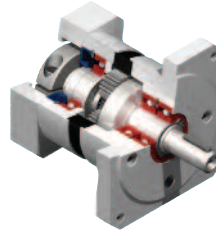
Planetary Gearboxes for NEMA Motors

SureGear® Planetary Gear Reducers for NEMA Motors – Overview

The SureGear PGCN series is a great gearbox (gear reducer) value for servo, stepper, and other motion control applications requiring a NEMA size input/output interface. It offers the best quality available for the price point.

Features

- Wide range of ratios (5, 10, 25, 50, and 100:1)
- Low backlash of 30 arc-min or less
- 20,000 hour service life
- Maintenance free; requires no additional lubrication
- NEMA sizes 17, 23, and 34
- Includes hardware for mounting to SureStep stepper motors
- Optional shaft bushings available for mounting to other motors

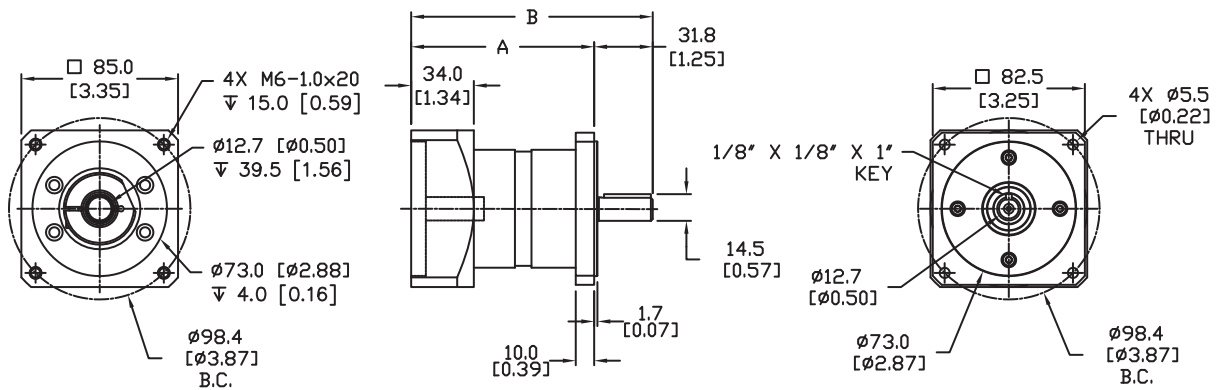
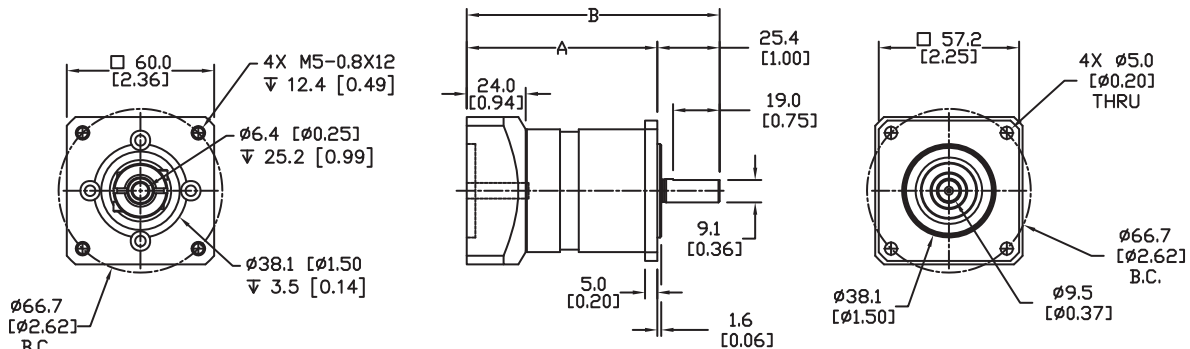
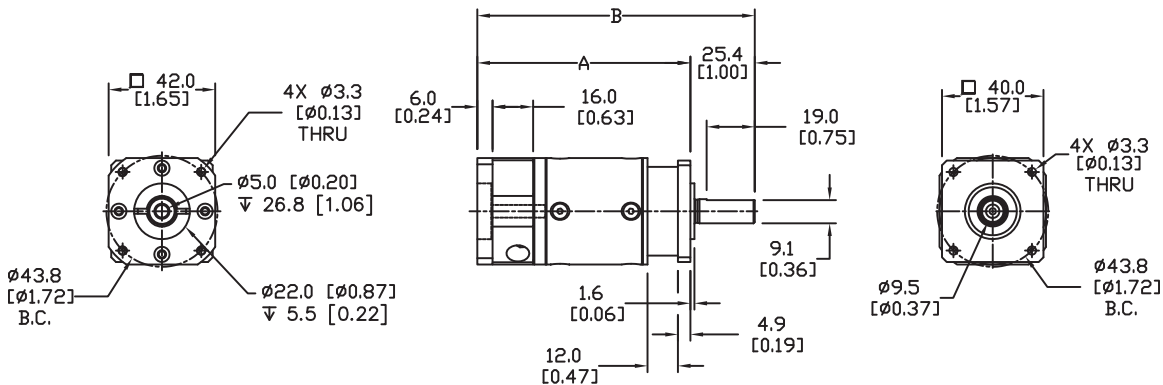


Applications

- Material handling
- Pick and place
- Automation
- Packaging
- Other motion control applications requiring a NEMA input/output

SureGear® NEMA Planetary Gearboxes																
Model-Specific Specifications																
Part Number	Price	Ratio	NEMA Frame Size	Nominal Output Torque (N·m [lb·in])	Maximum Acceleration Torque (N·m [lb·in])	Emergency Stop Torque (N·m [lb·in])	Standard Output Backlash (arc-min)	Allowable Radial Load (N [lb])	Allowable Axial Load (N [lb])	Torsional Stiffness (N·m/arc-min [lb·in/arc-min])	Mass Moment of Inertia (kg·cm ² [lb·in ²])	Efficiency (%)	Approx Weight (kg [lb])	Fits SureStep Stepper Motor		
PGCN17-055M	\$209.00	5:1	17	6.5 [58]	13 [115]	26 [230]	<25	361 [81]	298 [67]	0.8 [7.5]	0.0096 [0.003]	94	0.45 [1.0]	STP-MTR-170xx(D)		
PGCN17-105M	\$214.00	10:1		5.0 [44]	10 [89]	20 [177]	<25			0.5 [4.4]	0.0078 [0.003]	94	0.45 [1.0]			
PGCN17-255M	\$267.00	25:1		16 [142]	20 [177]	32 [283]	<30			0.8 [7.5]	0.0096 [0.003]	92	0.55 [1.2]			
PGCN17-505M	\$267.00	50:1		16 [142]	20 [177]	32 [283]	<30			0.8 [7.5]	0.0078 [0.003]	92	0.55 [1.2]			
PGCN17-1005M	\$267.00	100:1		5.0 [44]	10 [89]	20 [177]	<30			0.5 [4.4]	0.0078 [0.003]	92	0.55 [1.2]			
PGCN23-0525	\$285.00	5:1	23	6.5 [58]	13 [115]	26 [230]	<20			361 [81]	298 [67]	0.9 [8.0]	0.04 [0.014]	94	0.45 [1.0]	STP-MTR(H)-230xx(D)
PGCN23-1025	\$285.00	10:1		5.0 [44]	10 [89]	20 [177]	<20					0.6 [5.3]		94	0.45 [1.0]	
PGCN23-2525	\$310.00	25:1		16 [142]	20 [177]	32 [283]	<25					0.9 [8.0]		92	0.55 [1.2]	
PGCN23-5025	\$310.00	50:1		16 [142]	20 [177]	32 [283]	<25					0.9 [8.0]		92	0.55 [1.2]	
PGCN23-10025	\$310.00	100:1		5.0 [44]	10 [89]	20 [177]	<25					0.6 [5.3]		92	0.55 [1.2]	
PGCN34-0550	\$335.00	5:1	34	26 [230]	44 [389]	84 [743]	<15	476 [107]	425 [96]			2.4 [21.2]	0.36 [0.123]	94	1.1 [2.4]	STP-MTR(H)-34xxx(D)
PGCN34-1050	\$335.00	10:1		16 [142]	24 [212]	62 [549]	<15					1.3 [11.5]	0.34 [0.116]	94	1.1 [2.4]	
PGCN34-2550	\$394.00	25:1		42 [372]	52 [460]	84 [743]	<20					2.4 [21.2]	0.36 [0.123]	92	1.4 [3.1]	
PGCN34-5050	\$394.00	50:1		42 [372]	52 [460]	84 [743]	<20					2.4 [21.2]	0.34 [0.116]	92	1.4 [3.1]	
PGCN34-10050	\$394.00	100:1		16 [142]	24 [212]	62 [549]	<20					1.3 [11.5]	0.34 [0.116]	92	1.4 [3.1]	
Specifications Applicable to All PGCN Gearboxes																
Nominal Speed (rpm)				3500												
Maximum Input Speed (rpm)				6000												
Mounting Orientation				can be mounted in any orientation												
Environmental Rating				IP64												
Operating Temperature				-20 to 90 °C [-4 to 194 °F]												
Lubrication				Mineral Grease EPO												
Service Life (hrs)				>20,000												
NOTE: SureGear PGCN gearboxes (gear reducers) are <u>not</u> designed for back driving.																

Dimensions (dimensions = mm [in])



SureGear® NEMA Planetary Gearbox Dimensions (dimensions = mm [in])					
NEMA-17 Part Number	PGCN17-055M	PGCN17-105M	PGCN17-255M	PGCN17-505M	PGCN17-1005M
dimension A	84.0 [3.31]		99.8 [3.93]		
dimension B	109.4 [4.31]		125.2 [4.93]		
NEMA-23 Part Number	PGCN23-0525	PGCN23-1025	PGCN23-2525	PGCN23-5025	PGCN23-10025
dimension A	77.6 [3.06]		95.2 [3.75]		
dimension B	103.0 [4.06]		120.6 [4.75]		
NEMA-34 Part Number	PGCN34-0550	PGCN34-1050	PGCN34-2550	PGCN34-5050	PGCN34-10050
dimension A	99.3 [3.91]		121.3 [4.78]		
dimension B	131.1 [5.16]		153.0 [6.02]		



Planetary Gearboxes for NEMA Motors

Accessories



Typical PGCN Accessory Bushings



Typical PGCN Accessory Screws

SureGear® NEMA Planetary Gearbox Accessories			
Part Number	Price	Description	Fits SureGear NEMA Planetary Gearbox
PGCN17-SK	\$3.00	Mounting screws, replacement, for SureGear NEMA size 17 gearboxes (Package of 4)	PGCN17-xxxx
PGCN17-BSH5M	\$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 5mm diameter motor shaft	
PGCN17-BSH8M	\$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 8mm diameter motor shaft	
PGCN17-BSH9M	\$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 9mm diameter motor shaft	
PGCN17-BSH25	\$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 1/4 inch diameter motor shaft	
PGCN23-SK	\$3.00	Mounting screws, replacement, for SureGear NEMA size 23 gearboxes (Package of 4)	PGCN23-xxxx
PGCN23-BSH8M	\$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 8mm diameter motor shaft	
PGCN23-BSH9M	\$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 9mm diameter motor shaft	
PGCN23-BSH25	\$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 1/4 inch diameter motor shaft	
PGCN23-BSH37	\$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 3/8 inch diameter motor shaft	
PGCN34-SK	\$3.00	Mounting screws, replacement, for SureGear NEMA size 34 gearboxes (Package of 4)	PGCN34-xxxx
PGCN34-BSH9M	\$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 9mm diameter motor shaft	
PGCN34-BSH11M	\$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 11mm diameter motor shaft	
PGCN34-BSH37	\$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 3/8 inch diameter motor shaft	
PGCN34-BSH50	\$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 1/2 inch diameter motor shaft	

SureServo[®] AC Servo Systems

SureServo[®] AC servo systems

The SureServo family of brushless servo systems from AutomationDirect is fully digital and offers a rich set of features at dynamite prices. Choose from eight standard servo motors that are used in combination with one of three standard servo drives.

- Eight standard systems from 100W to 3kW
- Use with AutomationDirect CLICK, DirectLOGIC, or P3000 PLCs; or any other host controller
- Drives feature on-board indexer and adaptive tuning modes
- Free setup software
- 30-day money-back guarantee
- Two year warranty

Why use a servo?

The SureServo servo systems provide the highest possible level of performance for precise control of position, velocity, and torque. Compared to lower cost stepping systems, the SureServo products provide:

- More torque at higher speeds (up to 5,000 rpm)
- Broader range of power (up to 3kW)
- Higher response with closed-loop control (high hit rate without stalling or lost position)



SureServo family

The SureServo family is designed for flexibility and quick implementation. SureServo drives accept a wide range of command sources:

- Built-in motion controller w/preset position, velocity or torque
- Select presets with switch inputs and/or the multi-drop Modbus serial interface
- Position commands with "pulse and direction" or "count up and down" format
- Analog voltage Velocity or Torque command
- Encoder follower

For configuration, tuning and diagnostics, use the drive's integrated keypad/display or take advantage of the free SureServo Pro[®] PC-based software. Tune the system easily with adaptive auto-tuning selections or a manual mode.

Adapt to diverse applications with configurable I/O, including eight digital inputs, five digital outputs, two analog monitors and a scalable encoder output.

CHECK OUT OUR PRICES

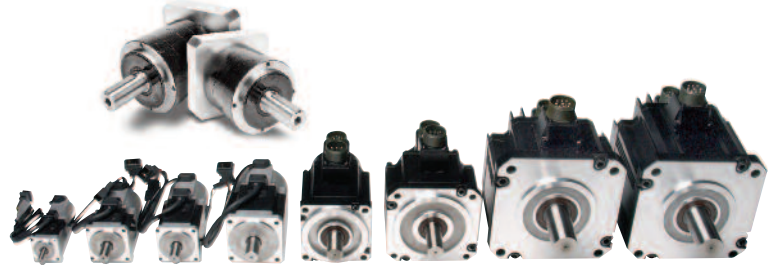
Servo Systems	AutomationDirect Price/Part Number	VS.	Allen-Bradley Price/Part Number
Digital Servo Drive	\$488.00 SVA-2040		\$1,220.00 2098-DSD-005
100W Servo Motor with connectorized Leads	\$325.00 SVL-201		\$558.00 TLY-A130T-HK62AA
Breakout Board Kit for CN1 Control Interface	\$94.00 ASD-BM-50A		\$246.00 2090-U3BK-D4401
10' Motor Feedback Cable	\$49.50 SVC-EFL-010		\$85.70 2090-CFBM6DF-CBAA03
10' Motor Power Cable	\$29.50 SVC-PFL-010		\$96.40 2090-CPBM6DF-16AA03
Configuration Software	FREE SV-PRO*		\$78.10 2098-UWCPRG
*SureServo Pro software is FREE when downloaded and is also available for \$9.00 on a CD			
Complete 1-axis 100W System	\$986.00		\$2,284.20

All prices are U.S. list prices. AutomationDirect prices are from April 2014 Price List. The Allen-Bradley 100W system consists of part numbers shown in table above with prices from www.rockwellautomation.com/en-e-tools/2/20/2014.



SureServo[®] AC Servo Systems

**3 Standard Drives ... 8 Standard Motors ... 100W to 3kW
... plus 25 gearboxes with four ratios**



Drive features

- **Main Power and Control Power Inputs**
 - Main Power: 230 VAC 1-phase/3-phase (2kW and 3kW systems are 3-phase only)
 - Control Power: 230 VAC Single Phase; 50/60 Hz
- **Fully digital with up to 450 Hz velocity loop response**
- **Easy setup and diagnostics with built-in keypad/display or the SureServo Pro PC-based software**
- **Five-in-one command options include:**
 - $\pm 10V$ torque or velocity command
 - Pulse train or master encoder position command (accepts line driver or open collector) with electronic gearing
 - Built-in indexer for position control using 8 preset positions and/or position setpoint with serial Modbus
- **Tuning aids include inertia estimation and easy tuning for up to 10 levels of response**
- **Optically isolated digital inputs (8) and outputs (5), analog outputs for monitor signals (2), and line driver output for encoder (with scalable resolution)**

Motor features

- **Low inertia models:**
 - 100W, 200W, 400W, 750W and 1kW
 - Speeds up to 5,000 rpm.
- **Medium inertia models:**
 - 1kW, 2kW and 3kW
 - Speeds up to 3,000 rpm.
- **Square flange mounting with metric dimensions:**
 - 40, 60, 80, 100, 130 and 180 mm flanges
- **Permanent magnet 3-phase synchronous motor**
- **Keyless drive shafts support clamp-on style coupling**
- **Integrated encoder with 2,500 (x4) pulses/revolution plus marker pulse (once per revolution)**
- **Optional 24 VDC spring-set holding brakes**
- **Standard hook-up cables for motor power/brake and encoder**
- **Standard DIN-rail mounted ZIPLink break-out kit for the drive's CN1 connector (with screw terminal connections)**

SureServo tuning technology

The SureServo drive closes the loop on current, velocity, and position (depending on control mode selection). Proportional gain, integral gain, feed forward compensation, command low pass filter, and a notch filter for resonance suppression are available. There are three tuning modes:

1. "Manual Mode" for user-defined adjustments
2. "Easy Mode" for default settings over a wide range of programmed inertia with 10 response levels
3. "Auto Mode" for automatic adjustment using an estimated (or measured) value of inertia

SureServo built-in motion controller

While the SureServo drives can accept traditional commands from host controls, they can also provide their own internal motion control. For example, up to eight index moves can be pre-defined and stored in the drive and then selected and executed using up to three discrete inputs. The predefined index profiles can also be changed via serial communications. The motion can be incremental or absolute (homing routines are available in the drive) and acceleration can be linear or S-curve.

Multiple drives can be daisy-chained and addressed separately using the drive's serial port. This allows very simple yet powerful control of multi-axis processes that do not need precise path control but only precise starting and stopping points. Applications include press feeds, auger fillers, rotary tables, robots for pick and place, test or assembly operations, drilling, cutting, tapping, and similar applications using simple index moves for single or multi-axis motion.

SureServo Optional Holding Brake

Each SureServo motor can be ordered with an optional 24VDC spring-set holding brake that holds the motor in place when power is removed.

SureGear[®] Precision Gearboxes for Servo motors

Inertia balancing issue in your design?

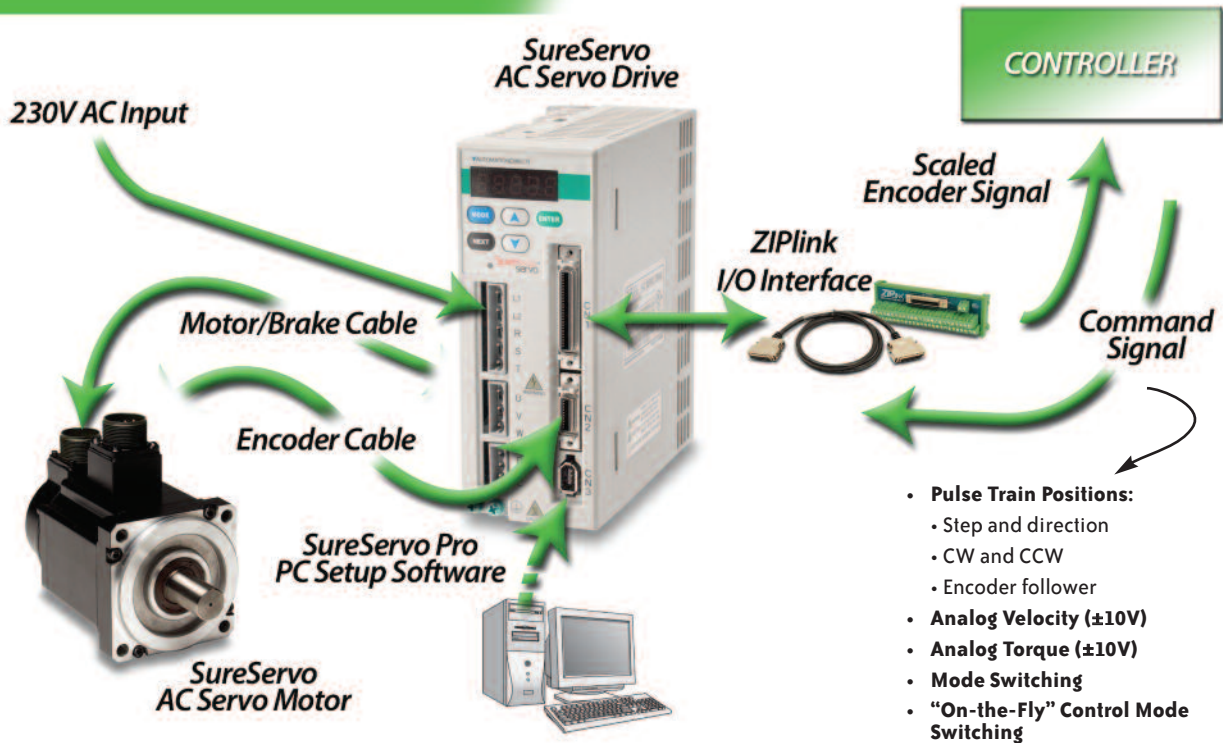
The SureGear PGA series easily mates to SureServo motors. Everything you need to mount your SureServo motor is included!

- Four gear ratios available (5, 10, 15, 25:1)
- Mounting hardware included for attaching to SureServo motors
- Industry-standard mounting dimensions
- Thread-in mounting style
- Best-in-class backlash (5 arc-min)
- 5-year warranty



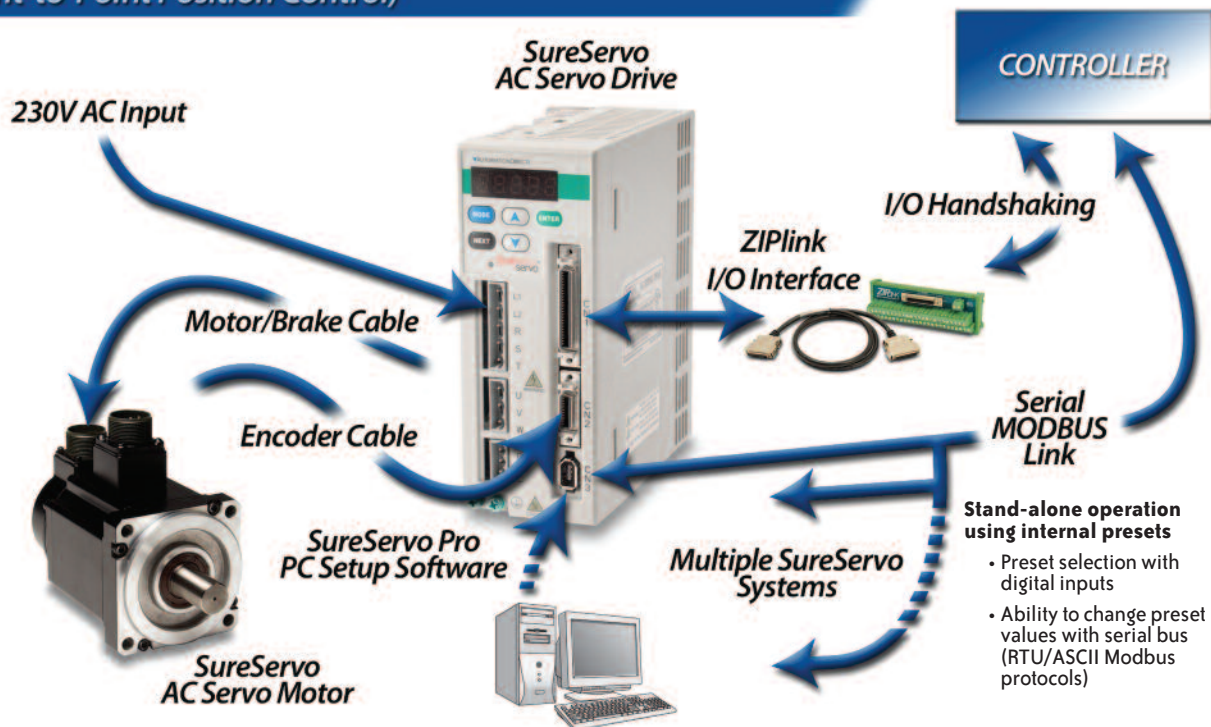
Sure **servo** **AC Servo Systems**

Traditional Command Sources



Built-in Indexer

(Point-to-Point Position Control)



SureServo[®] AC Servo Systems

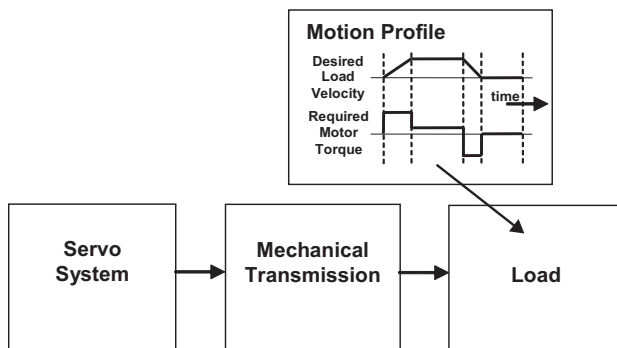
How to select and apply SureServo systems

The primary purpose of the AC servo system is to precisely control the motion of the load. The most fundamental considerations in selecting the servo system are "reflected" load inertia, servo system maximum speed requirement, servo system continuous torque requirement, and servo system peak torque requirement. In a retrofit application, select the largest torque SureServo system that most closely matches these parameters for

the system being replaced. In a new application, these parameters should be determined through calculation and/or measurement.

AutomationDirect has teamed with Copperhill Technologies to provide free servo-sizing software. "VisualSizer-SureServo" software will assist in determining the correct motor and drive for your application by calculating the reflected load inertia and required speed and torque based on the load configuration. "VisualSizer-SureServo" software can be downloaded from www.sureservo.com/downloads.htm.

Information for selecting SureServo systems is also included in Appendix B of the SureServo User Manual, which can be downloaded from the AutomationDirect.com website.



1. "Reflected" load inertia

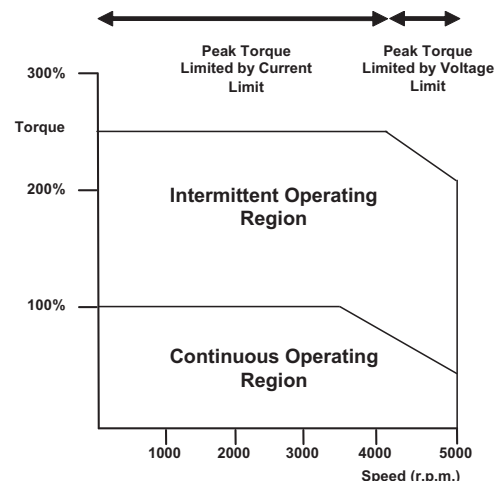
The inertia of everything attached to the servo motor driveshaft needs to be considered and the total "reflected" inertia needs to be determined. This means that all elements of any mechanical transmission and load inertia need to be translated into an equivalent inertia as if attached directly to the motor driveshaft. The ratio of "reflected" load inertia to motor inertia needs to be carefully considered when selecting the servo system.

In general, applications that need high response or bandwidth will

benefit from keeping the ratio of load inertia to motor inertia as low as possible and ideally under 10:1. Systems with ratios as high as 200:1 can be implemented, but corresponding lower bandwidth or responsiveness must be accepted. The servo response including the attached load inertia is determined by the servo tuning. SureServo systems may be tuned manually, adaptively with measurement of the load inertia, or set with default tuning based on a programmed value of load inertia.

2. Torque and speed

With knowledge of the motion profile and any mechanical transmission between the motor and load, calculations can be made to determine the required servo motor continuous torque, peak torque, and maximum motor speed. The required amount of continuous torque must fall inside the continuous operating region of the system torque-speed curve (you can check the continuous torque at the average speed of the motion profile). The required amount of peak torque must also fall within the servo system's intermittent operating region of the system torque-speed curve (you need to check this value at the required maximum speed).



Application tip - coupling considerations

The SureServo motors have keyless shafts that are designed for use with clamp-on or compression style couplings. Couplings using keys and/or set screws should NOT be used with SureServo motors as they are likely to come loose or damage the motor shaft. "Servo-grade" clamp-on or compression style couplings are usually the best choice when you consider the

stiffness, torque rating, and inertia. Higher stiffness (lb-in/radian) is needed for better response but there is a trade-off between the stiffness and the added inertia of the coupling. Concerning the torque rating of the coupling, use a safety factor of 1.25 over the SureServo peak torque requirement of your application.

Coupling Suppliers: www.sureservo.com/couplingconsiderations.htm

Mechanical transmissions

Common mechanical transmissions include leadscrews, rack & pinion mechanisms, conveyors, gears, and timing belts. The use of leadscrew, rack & pinion, or conveyor are common ways to

translate the rotary motion of the servo motor into linear motion of the load. The use of a speed reducer such as a gearbox or timing belt can be very beneficial as follows:

1. Reduction of reflected load inertia

As a general rule, it is beneficial to keep the reflected load inertia as low as possible while using the full range of servo speed. SureServo systems can go up to 5,000 rpm for the low inertia motors and up to 3,000 rpm for the medium inertia motors.

Example: A gearbox reduces the required torque by a factor of the gear ratio, and reduces the reflected load inertia by a factor of the gear ratio squared. A 10:1 gearbox reduces output speed to 1/10, increases output torque 10 times, and decreases reflected inertia to 1/100.

However, when investigating the effect of different speed reduction ratios DO NOT forget to include the added inertia of couplings, gearbox, or timing belt pulleys. These added inertias can be significant, and can negate any inertia reduction due to the speed reduction.

2. Low speed and high torque applications

If the application requires low speed and high torque then it is common to introduce a speed reducer so that the servo system can operate over more of the available speed range. This could also have the added benefit of reducing the servo motor torque requirement which could allow you to use a smaller and lower cost servo system. Additional benefits are also possible with reduction in reflected inertia, increased number of motor encoder counts at the load, and increased ability to reject load disturbances due to mechanical advantage of the speed reducer.

3. Space limitations and motor orientation

SureServo motors can be mounted in any orientation, but the shaft seal should not be immersed in oil (open-frame gearbox, etc.). Reducers can possibly allow the use of a smaller motor or allow the motor to be repositioned. For example, some reducers would allow for in-line, right angle, or parallel mounting of the motor. For more information, refer to the website listed below.

www.sureservo.com/mechanical_trans.htm

Ordering guide instructions

The following four pages are your ordering guide for the eight standard SureServo systems. Each of the eight standard systems has a torque-speed curve including the motor inertia for reference. This is the fundamental information that you need to select the servo drive and matching motor for your application.

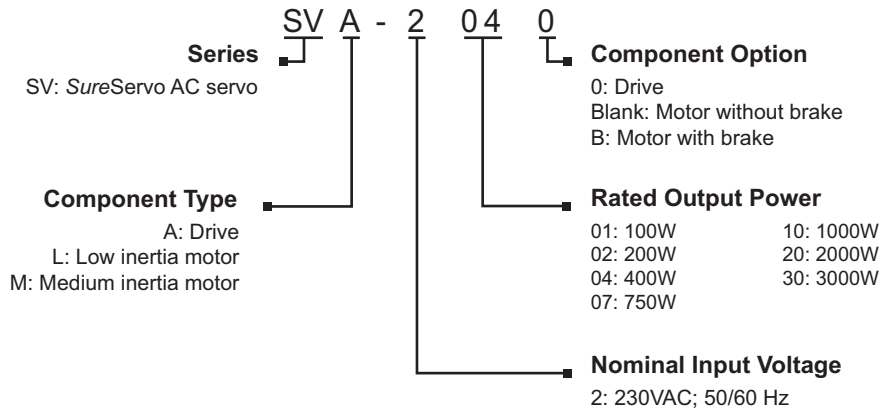
Don't forget the cables and ZIPLink break-out board kit!

Included in the ordering guide are the available connection cables from the drive to motor in standard lengths from 10 to 60 feet. The break-out board kit includes a 0.5m (19 inch) cable for the CN1 I/O interface, and is listed for your convenience. We highly recommend all five items per system as a minimum. All cables are 100% factory tested to make your system installation as easy and quick as possible. See the Accessories section for regeneration resistors, AC line filters, fuses, contactors, and RF noise filters.



AC Servo System Configuration

SureServo series drives and motors part numbering system



Here is what you will need to order a complete servo system:



NOTE: UNIT CAN BE PROGRAMMED VIA KEYPAD.

OPTIONAL PROGRAMMING SOFTWARE (FREE DOWNLOAD) AND OPTIONAL PROGRAMMING CABLE AVAILABLE.



If you need a gear box for your configuration, you can do it easily online:
<http://www.sureservo.com/gearbox/selector>

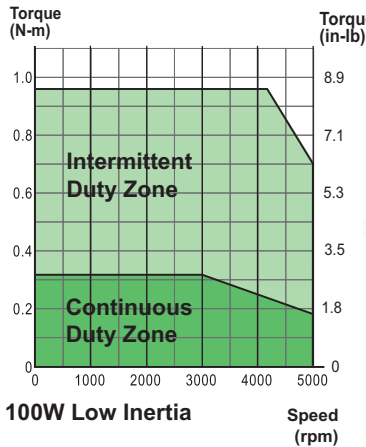
SureServo AC servo drive, motor, and cable combinations

Inertia & Power		Drive and Motor			Power Cables (from Drive to Motor)				Encoder Feedback Cables				Miscellaneous	
Inertia	Power	Servo Drive	Servo Motor without brake (note)	Servo Motor with brake (note)	10 ft	20 ft	30 ft	60 ft	10 ft	20 ft	30 ft	60 ft	ZIPLink I/O Interface	RS-422/485 Serial Communication Cable
Low inertia	100W	SVA-2040	SVL-201	SVL-201B	SVC-PFL-010	SVC-PFL-020	SVC-PFL-030	SVC-PFL-060	SVC-EFL-010	SVC-EFL-020	SVC-EFL-030	SVC-EFL-060	ZL-RTB50 and ZL-SVC-CBL50 or ZL-SVC-CBL50-1 or ZL-SVC-CBL50-2	SVC-MDCOM-CBL
	200W		SVL-202	SVL-202B										
	400W		SVL-204	SVL-204B										
	750W	SVA-2100	SVL-207	SVL-207B	SVC-PHM-010	SVC-PHM-020	SVC-PHM-030	SVC-PHM-060	SVC-EHH-010	SVC-EHH-020	SVC-EHH-030	SVC-EHH-060		
	1000W		SVL-210	SVL-210B										
Medium inertia	1000W	SVA-2300	SVM-210	SVM-210B	SVC-PHH-010	SVC-PHH-020	SVC-PHH-030	SVC-PHH-060	SVC-EHH-010	SVC-EHH-020	SVC-EHH-030	SVC-EHH-060		
	2000W		SVM-220	SVM-220B										
	3000W	SVM-230	SVM-230B											
NOTE: EACH SERVO MOTOR REQUIRES AN ENCODER FEEDBACK CABLE AND A POWER CABLE. THE MOTOR POWER CABLE INCLUDES BRAKE POWER WIRES FOR THE OPTIONAL MOTOR BRAKE.														



AC Servo System Configuration

100W Low Inertia System



J_m = Motor Inertia = 0.000027 lb-in-s² (0.000003 kg - m²)

For all systems:
Order programming software &
programming cable if needed.
See pgs. MC-35 & MC-36.

1.



SureServo Motor

2.



Motor Power Cable (1)

3.



Motor Encoder Cable (1)

4.

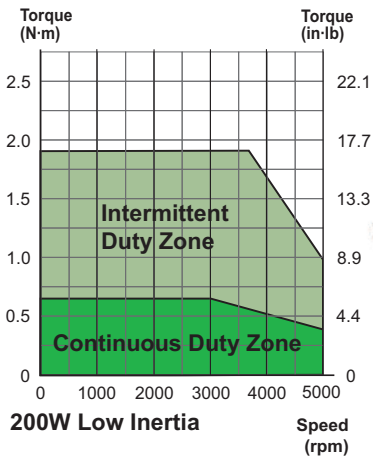


ZIPLink I/O Interface

5.



200W Low Inertia System



J_m = Motor Inertia = 0.00016 lb-in-s² (0.000018 kg - m²)

1.



SureServo Motor

2.



Motor Power Cable (1)

3.



Motor Encoder Cable (1)

4.

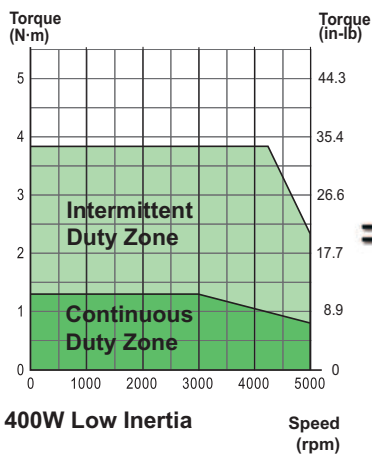


ZIPLink I/O Interface

5.



400W Low Inertia System



J_m = Motor Inertia = 0.0003 lb-in-s² (0.000034 kg - m²)

1.



SureServo Motor

2.



Motor Power Cable (1)

3.



Motor Encoder Cable (1)

4.



ZIPLink I/O Interface

5.



Company
Information

Drives

Soft Starters

Motors

Power
Transmission

Motion: Servos
and Steppers

Motor Controls

Sensors:
Proximity

Sensors:
Photoelectric

Sensors:
Encoders

Sensors:
Limit Switches

Sensors:
Current

Sensors:
Pressure

Sensors:
Temperature

Sensors:
Level

Sensors:
Flow Switches

Pushbuttons
and Lights

Stacklights

Signal
Devices

Process

Relays and
Timers

Pneumatics:
Air Prep

Pneumatics:
Directional Control
Valves

Pneumatics:
Cylinders

Pneumatics:
Tubing

Pneumatics:
Air Fittings

Appendix
Book 2

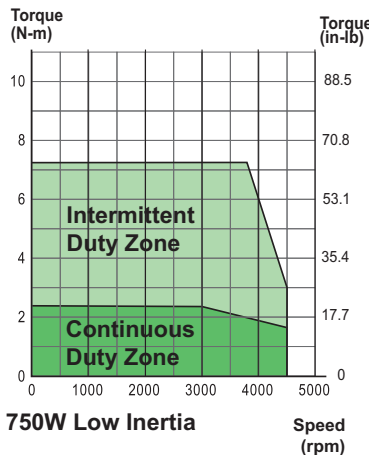
Terms and
Conditions



AC Servo System Configuration

For all systems:
Order programming software &
programming cable if needed.
See pgs. MC-35 & MC-36

750W Low Inertia System



1.



Servo Drive
SVA-2100 \$632.00

$J_m = \text{Motor Inertia} = .00096 \text{ lb-in-s}^2 (0.000108 \text{ kg} \cdot \text{m}^2)$

SureServo Motor

2.



SVL-207 \$514.00
SVL-207B (w/brake) \$734.00

Motor Power Cable (1)

3.



SVC-PFL-010 (10') \$29.50
SVC-PFL-020 (20') \$52.00
SVC-PFL-030 (30') \$63.00
SVC-PFL-060 (60') \$115.00

Motor Encoder Cable (1)

4.



SVC-EFL-010 (10') \$49.50
SVC-EFL-020 (20') \$73.00
SVC-EFL-030 (30') \$87.00
SVC-EFL-060 (60') \$113.00

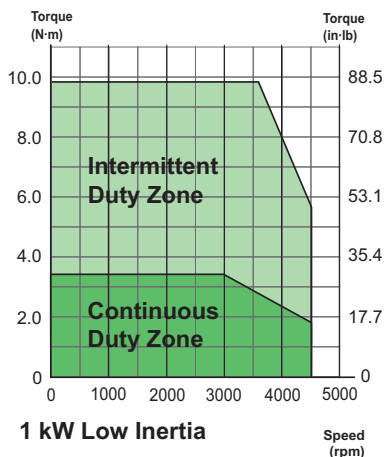
ZIPLink I/O Interface

5.



ZL-RTB50 \$45.50
and one cable below:
ZL-SVC-CBL50 (0.5m) \$33.50
ZL-SVC-CBL50-1 (1m) \$34.50
ZL-SVC-CBL50-2 (2m) \$36.50

1 kW Low Inertia System



1.



Servo Drive
SVA-2100 \$632.00

$J_m = \text{Motor Inertia} = .0023 \text{ lb-in-s}^2 (0.00026 \text{ kg} \cdot \text{m}^2)$

SureServo Motor

2.



SVL-210 \$613.00
SVL-210B (w/brake) \$919.00

Motor Power Cable (1)

3.



SVC-PHM-010 (10') \$85.00
SVC-PHM-020 (20') \$95.00
SVC-PHM-030 (30') \$117.00
SVC-PHM-060 (60') \$181.00

Motor Encoder Cable (1)

4.



SVC-EHH-010 (10') \$81.00
SVC-EHH-020 (20') \$93.00
SVC-EHH-030 (30') \$104.00
SVC-EHH-060 (60') \$134.00

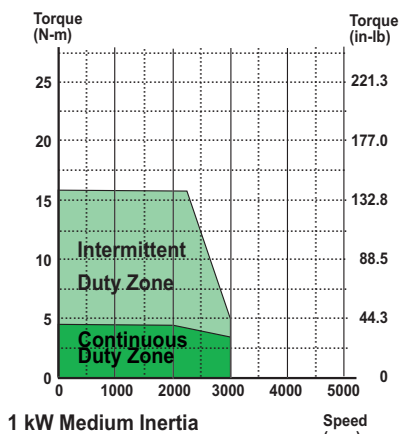
ZIPLink I/O Interface

5.



ZL-RTB50 \$45.50
and one cable below:
ZL-SVC-CBL50 (0.5m) \$33.50
ZL-SVC-CBL50-1 (1m) \$34.50
ZL-SVC-CBL50-2 (2m) \$36.50

1 kW Medium Inertia System



1.



Servo Drive
SVA-2100 \$632.00

$J_m = \text{Motor Inertia} = .0053 \text{ lb-in-s}^2 (0.000598 \text{ kg} \cdot \text{m}^2)$

SureServo Motor

2.



SVM-210 \$788.00
SVM-210B (w/brake) \$1,095.00

Motor Power Cable (1)

3.



SVC-PHM-010 (10') \$85.00
SVC-PHM-020 (20') \$95.00
SVC-PHM-030 (30') \$117.00
SVC-PHM-060 (60') \$181.00

Motor Encoder Cable (1)

4.



SVC-EHH-010 (10') \$81.00
SVC-EHH-020 (20') \$93.00
SVC-EHH-030 (30') \$104.00
SVC-EHH-060 (60') \$134.00

ZIPLink I/O Interface

5.



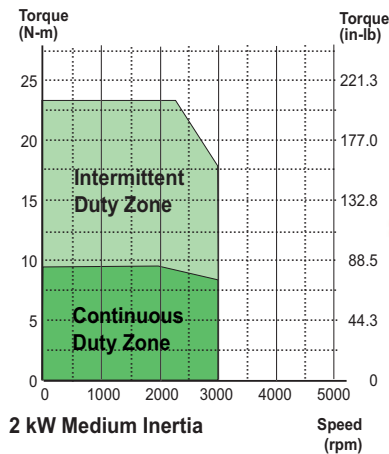
ZL-RTB50 \$45.50
and one cable below:
ZL-SVC-CBL50 (0.5m) \$33.50
ZL-SVC-CBL50-1 (1m) \$34.50
ZL-SVC-CBL50-2 (2m) \$36.50



AC Servo System Configuration

For all systems:
Order programming software &
programming cable if needed.
See pgs. MC-35 & MC-36.

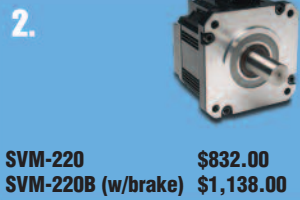
2 kW Medium Inertia System



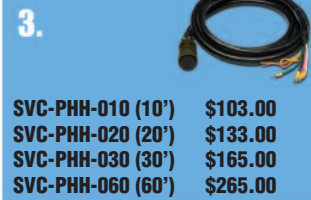
$$J_m = \text{Motor Inertia} = .014 \text{ lb-in-s}^2 = (0.00158 \text{ kg} \cdot \text{m}^2)$$



SureServo Motor



Motor Power Cable (1)



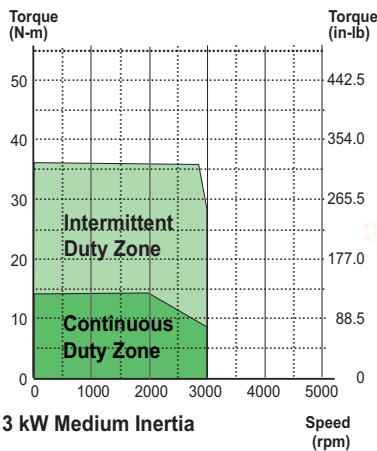
Motor Encoder Cable (1)



ZIPLink I/O Interface



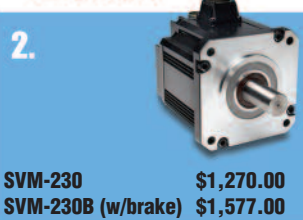
3 kW Medium Inertia System



$$J_m = \text{Motor Inertia} = 0.038 \text{ lb-in-s}^2 = (0.00433 \text{ kg} \cdot \text{m}^2)$$



SureServo Motor



Motor Power Cable (1)



Motor Encoder Cable (1)



ZIPLink I/O Interface



NOTE: ALL MOTOR POWER CABLES INCLUDE BRAKE POWER WIRES FOR THE OPTIONAL MOTOR BRAKE.

SureServo Communications Cables for Multi-drop Networks

Product	Price	Description
SVC-MDCOM-CBL	\$18.00	RS-422/485 serial communication cable for use with multidrop networks; 3ft length; IEEE 1394 plug to unterminated wires; compatible with all SureServo systems. Facilitates connection between the SureServo drive serial port and host controllers.
SVC-232RJ12-CBL-2 *	\$7.00	ZIPLink SureServo Drives cable with 6-pin RJ12 connector to a 6-pin IEEE 1394 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. For RS-232 connection to all SureServo amplifiers.
SVC-485RJ12-CBL-2 *	\$9.00	ZIPLink SureServo amplifier communication cable, RJ12 male to 6-pin IEEE 1394 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. Cable used in conjunction with ZL-CDM-RJ12xxx distribution module can access a compatible RS-485 device network.
SVC-485HD15-CBL-2 *	\$7.50	ZIPLink SureServo Drives cable with a HD 15-pin male to a 6-pin IEEE 1394 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. For RS-485 connection to all SureServo amplifiers.

* Refer to the ZIPLinks Wiring Solutions section for complete information regarding the ZIPLink cables.



SureServo[®] AC Servo System Software

SureServo Pro configuration software

SureServo Pro is an optional free downloadable configuration software package for the SureServo drives. With SureServo Pro installed, the personal computer may be directly connected to the servo drive's serial port via the PC's RS-232 serial port*. A six-foot configuration cable (SVC-PCCFG-CBL, \$18.00) is available to make the connection between the drive serial port and PC DB-9 serial port simple.

***Note: Use our USB-RS232 converter cable in conjunction with the SVC-PCCFG-CBL cable on PCs having only USB ports.**

Features

- Quick Start - The basic setup when you have limited time and just want to get up and running ASAP.
- Maintenance keypad allows the user to operate the servo system from the PC. This is a great aid during start-up to allow the servo to perform some basic motion and to check the I/O.
- Detailed - The complete setup for all the drive parameters
- Tune and check the servo response live using the scope feature.
- Upload and download the drive setup. Save the drive setup as a file for future use.
- Edit the drive setup
- View all drive faults
- Trend drive variables in real time

System Requirements

- Windows 7, Windows 2000, XP Pro
- 24 MB of RAM
- 16 MB hard disk
- RS232 serial port or USB port
- Internet Explorer 4.0 or higher (for HTML help support)

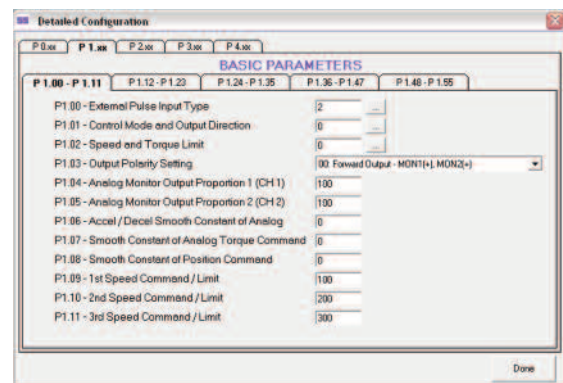


Parameter views

The SureServo Pro configuration tool logically organizes over 165 servo drive parameters into five tabbed groups. Each parameter has a factory default that usually allows the servo to run "out-of-the-box".

The parameters can be easily changed with available options or setting ranges displayed. Tuning modes and parameters can also be changed using SureServo Pro. After the parameters have been defined, the complete setup can be stored and archived. Drive configurations can be uploaded, edited, saved, and downloaded as often as necessary.

Parameter View Example Screen - Basic Parameters



SureServo Software and Configuration Cables

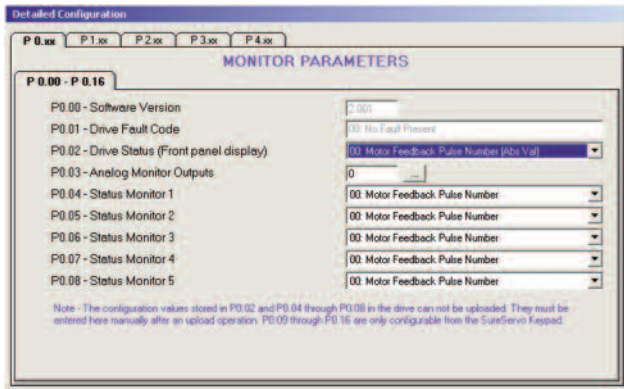
Product	Price	Description
SV-PRO	Free	SureServo Pro configuration software for use with all SureServo servo systems. FREE download from www.sureservo.com or www.automationdirect.com websites.
SV-PRO	\$9.00	CD with SureServo Pro configuration software
SVC-PCCFG-CBL	\$18.00	Six-foot RS-232 communications cable; connects servo drive serial port to PC DB-9 serial port. <i>For PCs having only USB ports, use our USB-RS232 converter cable in conjunction with the SVC-PCCFG-CBL cable.</i>
SVC-485CFG-CBL-2 *	\$10.00	ZIPLink SureServo amplifier configuration cable, 6-pin IEEE 1394 connector to RJ45 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. <i>Use this cable in conjunction with our USB-485M serial adapter to connect any SureServo amplifier to a PC. Eliminates the need to reprogram networked servo drives from RS485 to RS232 when connecting to a PC.</i>
* Refer to the ZIPLinks Wiring Solutions section for complete information regarding ZIPLink cable SVC-485CFG-CBL-2.		



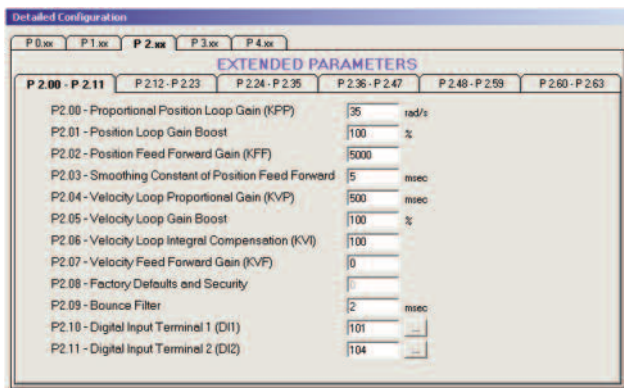
AC Servo System Software

SureServo Pro configuration software - Parameter views (continued)

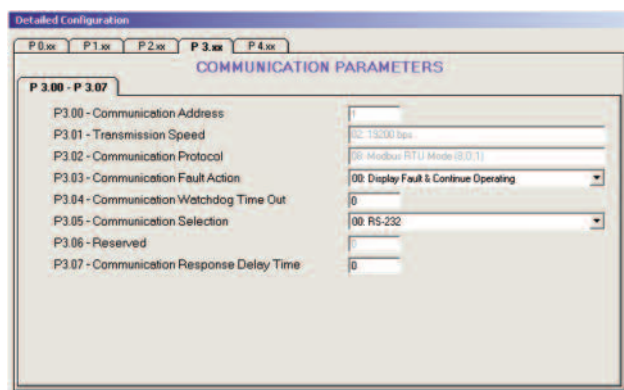
Parameter View Example Screen - Monitor Parameters



Parameter View Example Screen - Extended Parameters

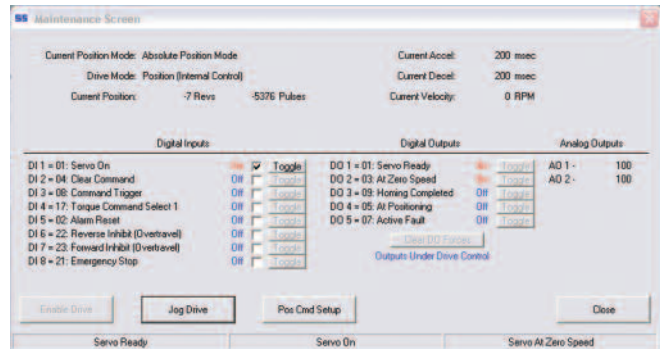


Parameter View Example Screen - Communication Parameters



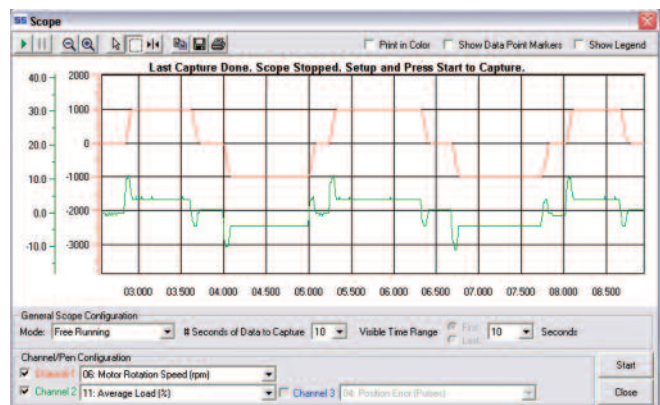
Maintenance screen

A maintenance keypad allows the user to operate the servo system from the PC. This is a great aid during start-up to allow the servo to perform some basic motion and to check the I/O.



Scope

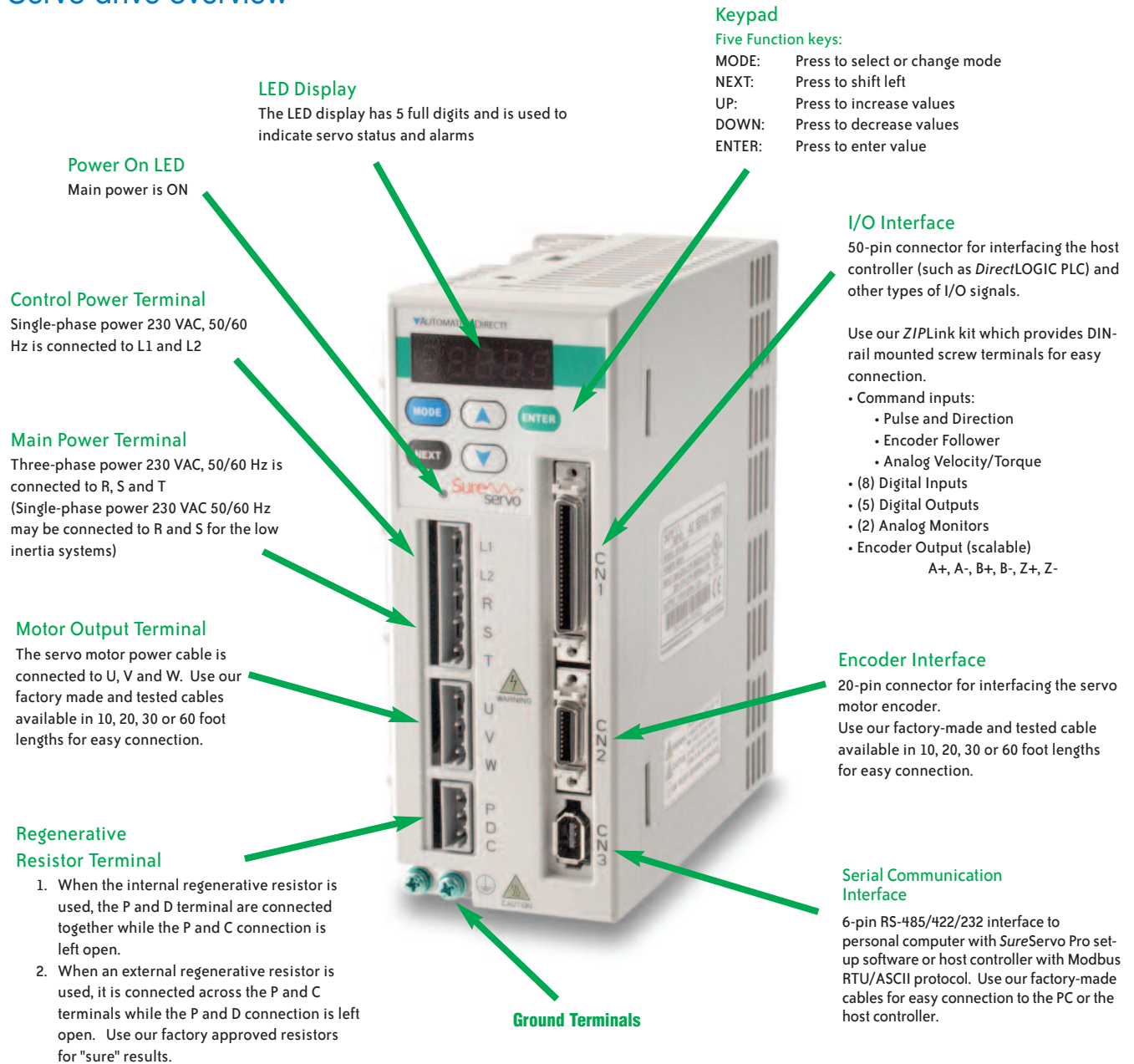
SureServo Pro includes a powerful scope function that allows the user to have as many as three channels of data displayed simultaneously. Each channel has a drop-down table to select the data to be displayed. The scope also has a trigger mode and timebase selection. This function is a valuable tool for tuning SureServo drives.





AC Servo Drive Specifications

Servo drive overview



SureServo systems run "out-of-the-box"... but may be reconfigured for many applications!

The *SureServo* drives are fully digital and include over 165 programmable parameters. For convenience, the parameters are grouped into five categories:

- 1) Monitor parameters
- 2) Basic parameters
- 3) Extended parameters
- 4) Communication parameters
- 5) Diagnostic parameters.

All parameters have commonly used default values which allow you to operate the *SureServo* system "out-of-the-box". However, the programmability and large variety of parameters make the *SureServo* systems suitable for a very broad range of applications, including almost all types of general purpose industrial machinery such as assembly, test, packaging, machine tool, and robotics.



AC Servo Drive Specifications

Servo drive specifications

General Drive Specifications	
Permissible Frequency	50/60 Hz $\pm 5\%$
Encoder Resolution / Feedback Resolution	2500 lines / 10000 ppr
Control of Main Circuit	SVPWM (Space Vector Pulse Width Modulation) Control
Tuning Modes	Easy / Auto / Manual
Dynamic Brake	Built-in control
Analog Monitor Outputs (2)	Monitor signal can be set by parameters (Output voltage range: $\pm 8V$; Resolution: 12.8 mV/count)
8 Programmable Digital Inputs (45 selectable functions)	Servo enable, Alarm reset, Gain switching, Pulse counter clear, Fault stop, CW/CCW over-travel
	Internal parameter selection, Torque limit activation, Velocity limit activation, Control mode selection
Scalable Encoder Output	Encoder signal output A, /A, B, /B, Z /Z, Line Driver
5 Programmable Outputs (9 selectable indicators)	Servo ready, Servo On, Low velocity, Velocity reached, In Position, Torque limiting, Servo fault, Electromagnetic brake control, Home search completed
Communication Interface	RS-232 / RS-485 / RS-422 / Modbus ASCII & RTU up to 115k Baud
Protective Functions	Overcurrent, Overvoltage, Undervoltage, Overload, Excessive velocity/position error, Encoder error, Regeneration error, Communication error
Installation Site	Indoor location (free from direct sunlight), no corrosive liquid and gas (far away from oil mist, flammable gas, dust)
Altitude	1000m [3281 ft] above sea level – maximum
Operating Temperature	0 to 55 °C [32 to 131 °F] (If operating temperature is above 55°C, forced cooling is required). For long-term reliability, the ambient temperature of SureServo systems should be under 45°C (113°F).
Storage Temperature	-20° to 65°C (-4° to 149°F)
Humidity	0 to 90% (non-condensing)
Vibration	9.81 m/s ² (1G) less than 20Hz, 5.88 m/s ² (0.6G) 20 to 50 Hz
Protection	IP 20
Agency Approvals	CE; UL listed (U.S. and Canada)

Company
Information

Drives

Soft Starters

Motors

Power
TransmissionMotion: Servos
and Steppers

Motor Controls

Sensors:
ProximitySensors:
PhotoelectricSensors:
EncodersSensors:
Limit SwitchesSensors:
CurrentSensors:
PressureSensors:
TemperatureSensors:
LevelSensors:
Flow SwitchesPushbuttons
and Lights

Stacklights

Signal
Devices

Process

Relays and
TimersPneumatics:
Air PrepPneumatics:
Directional Control
ValvesPneumatics:
CylindersPneumatics:
TubingPneumatics:
Air FittingsAppendix
Book 2Terms and
Conditions



AC Servo Drive Specifications

Servo drive specifications (continued)

Model and Mode Specific Drive Specifications										
	AC Servo Model		SVA-2040			SVA-2100			SVA-2300	
	Price		\$488.00			\$632.00			\$1,054.00	
	Voltage Phase		Single-phase or Three-phase						Three-phase	
	Voltage and Frequency Range		3-phase: 170~255 VAC @ 50/60 Hz ±5%; 1-phase: 200~255 VAC @ 50/60 Hz ±5%						170~255 VAC @ 50/60 Hz ±5%	
	Main Circuit Input Current	Single Phase	3.4A @ 400W			8.0A @ 1kW			—	
		Three Phase	2.6A @ 400W			6.2A @ 1kW			13.6A @ 3kW	
	Main Circuit Inrush Current		44A			77A			87A	
	Main Circuit Power Cycling		Maximum 1 power cycle per minute							
	Control Circuit Current and Voltage		43 mA @ 200~255 VAC, 1 phase							
	Control Circuit Inrush Current		32A maximum							
	Cooling System		Natural Air Circulation			Internal Cooling Fan				
	Drive Heat Loss *	Motor driven *	SVL-201(B)	SVL-202(B)	SVL-204(B)	SVL-207(B)	SVL-210(B)	SVM-210(B)	SVM-220(B)	SVM-230(B)
		Heat Loss	12W	15W	20W	35W	45W	50W	75W	80W
Weight		1.5 kg [3.3 lb]			2kg [4lb]			3kg [7lb]		
Position Control Mode	Max. Input Pulse Frequency		Max. 500 kpps (Line driver); Max. 200 kpps (Open collector)							
	Pulse Type		Pulse + Direction, A phase + B phase Quadrature, CCW pulse + CW pulse							
	Command Source		External pulse train / Onboard indexer							
	Smoothing Strategy		Low-pass and P-curve filter							
	Electronic Gear		Electronic gear N/M multiple; N: 1~32767, M: 1~32767(1/50<N/M<200)							
	Torque Limit Operation		Set by parameters or by analog input							
	Feed Forward Compensation		Set by parameters							
Velocity Control Mode	Analog Input Command	Voltage Range	Bipolar ±10 VDC							
		Input Resistance	10 kΩ							
		Time Constant	2.2 μs							
		Resolution	(Varies with input voltage) 13 bits @ 0V~1V; 13~10 bits @ 1V~2V; 10 bits @ 2V~10V							
	Speed Control Range		1:5000							
	Command Source		External analog signal / Onboard indexer							
	Smoothing Strategy		Low-pass and S-curve filter							
	Torque Limit Operation		Set by parameters or via analog input							
	Frequency Response Characteristic		Maximum 450 Hz							
	Speed Accuracy (at rated rotation speed)		0.01% or less at 0 to 100% load fluctuation							
0.01% or less at ±10% power fluctuation										
0.01% or less at 0 to 50°C ambient temperature fluctuation										
Torque Control Mode	Analog Input Command	Voltage Range	Bipolar ±10 VDC							
		Input Resistance	10 kΩ							
		Time Constant	2.2 μs							
		Resolution	10 bits							
	Permissible Time for Overload		8 sec. under 200% rated output							
	Command Source		External analog signal / Onboard indexer							
	Smoothing Strategy		Low-pass filter							
	Speed Limit Operation		Set by parameters or via analog input							
* Drive heat loss varies depending upon which motor is connected to the drive.										

* Drive heat loss varies depending upon which motor is connected to the drive.

Servo motor overview

**Motor Power and
Brake Connector**
1-foot cable with
6-position connector
(Not liquid tight)

**750W
and
below**

Encoder Connector
1-foot cable with
9-position connector
(Not liquid tight)

IP65 Housing

Low Inertia Motors
• 100W 40 mm flange
• 200W 60 mm flange
• 400W 60 mm flange
• 750W 80 mm flange

Keyless Shafts
• 100W 8 mm
diameter
• 200W 14 mm
diameter
• 400W 14 mm
diameter
• 750W 19 mm
diameter

Without Shaft Seal
(not liquid tight)

**All SureServo motors have keyless
shafts for use with servo-grade clamp
or compression couplings.**

Motor Power and Brake Connector
(Liquid tight when using AutomationDirect cables)

Encoder Connector
(Liquid tight when using AutomationDirect cables)

IP65 Housing

**1 kW
and
above**

Low and Medium Inertia Motors
Low Inertia Model
• 1 kW 100 mm flange
Medium Inertia Models
• 1 kW 130 mm flange
• 2 kW 180 mm flange
• 3 kW 180 mm flange

Keyless Shafts
Low Inertia Model
• 1 kW 22 mm diameter
Medium Inertia Models
• 1 kW 22 mm diameter
• 2 kW 35 mm diameter
• 3 kW 35 mm diameter

With Shaft Seal
(liquid tight)

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Photoelectric

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Encoders

Sensors:
Limit Switches

Sensors:
Current

Sensors:
Pressure

Sensors:
Temperature

Sensors:
Level

Sensors:
Flow Switches

Pushbuttons
and Lights

Stacklights

Signal
Devices

Process

Relays and
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Air Prep

Pneumatics:
Directional Control
Valves

Pneumatics:
Cylinders

Pneumatics:
Tubing

Pneumatics:
Air Fittings

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AC Servo Motor Specifications

Motor Specifications											
Inertia Range			Low				Medium				
Model Name: Sxx-xxx			SVL-201	SVL-202	SVL-204	SVL-207	SVL-210	SVM-210	SVM-220	SVM-230	
Price			\$325.00	\$393.00	\$481.00	\$514.00	\$613.00	\$788.00	\$832.00	\$1,270.00	
Model with brake: Sxx-xxxB			SVL-201B	SVL-202B	SVL-204B	SVL-207B	SVL-210B	SVM-210B	SVM-220B	SVM-230B	
Price			\$525.00	\$581.00	\$678.00	\$734.00	\$919.00	\$1,095.00	\$1,138.00	\$1,577.00	
Rated output power		W	100	200	400	750	1000	1000	2000	3000	
Rated torque		N·m	0.32	0.64	1.27	2.39	3.3	4.8	9.4	14.3	
		lb·in	2.8	5.7	11.2	21.2	29.2	42.5	83.2	126.6	
Maximum torque		N·m	0.95	1.91	3.82	7.16	9.9	15.7	23.5	35.8	
		lb·in	8.4	16.9	33.8	63.4	87.6	138.9	208.0	316.8	
Rated speed		rpm	3000				2000				
Max. speed		rpm	5000			4500		3000			
Rated current		A	1.1	1.7	3.3	5.0	6.8	5.6	13.1	17.4	
Max. current		A	3.0	4.9	9.3	14.1	18.7	17.6	31.4	42.3	
Drive input current		1 phase A	1.0	1.7	3.4	5.9	8.0	8.0	-	-	
		3 phase A	0.8	1.3	2.6	4.7	6.2	6.2	9.1	13.6	
Max. radial shaft load		N	78.4	196		343	490		784		
		lb	18	44		77	110		176		
Max. thrust shaft load		N	39.2	68.6		98		392			
		lb	9	15		22		88			
Brake		Voltage	VDC	24							
		Current	ADC	0.21	0.38		0.4	0.75	0.83	1.45	1.67
		Holding Torque	N·m	0.32	1.27		2.55	9.3	7.5	32.0	50.0
			lb·in	2.83	11.24		22.57	82.3	66.38	283.2	442.5
Rotor inertia w/o brake		kg·m ²	0.03E-4	0.18E-4	0.34E-4	1.08E-4	2.6E-4	5.98E-4	15.8E-4	43.3E-4	
		lb·in·s ²	0.27E-4	1.59E-4	3.0E-4	9.56E-4	23.0E-4	52.9E-4	139.8E-4	383.2E-4	
Rotor inertia with brake		kg·m ²	0.06E-4	0.28E-4	0.44E-4	1.32E-4	3.1E-4	8.8E-4	27.8E-4	56.3E-4	
		lb·in·s ²	0.53E-4	2.48E-4	3.9E-4	11.7E-4	27.4E-4	77.9E-4	246.0E-4	498.3E-4	
Mechanical time constant		ms	0.6	0.9	0.7	0.6	1.7	1.4	1.6	0.9	
Static friction torque		N·m	0.02	0.04		0.08	0.49	0.29	0.98		
Torque constant-KT		N·m/A	0.32	0.39	0.4	0.5	0.56	0.91	0.77	0.86	
Voltage constant-KE		V/rpm	33.7E-3	41.0E-3	41.6E-3	52.2E-3	58.4E-3	95.71E-3	81.1E-3	90.5E-3	
Armature resistance		Ω	20.3	7.5	3.1	1.3	2.052	1.98	0.6	0.162	
Armature inductance		mH	32	24	11	6.3	8.4	13.2	6.1	2.3	
Electrical time constant		ms	1.6	3.2	3.2	4.8	4.1	6.7	10.1	14.2	
Motor Type			Brushless, AC, permanent magnet [Neodymium (Nd), Iron (Fe), Boron (B)]								
Insulation class			Class F								
Insulation resistance			>100 MΩ , 500 VDC								
Insulation strength			1500 VAC, 50 Hz, 60 seconds								
Ambient temperature range			0 to 40°C (32°F to 104°F)								
Operating temperature (measured case temperature)			70°C (158°F)								
Maximum operating temperature (measured case temperature)			70°C + 40°C = 110°C (230°F)								
Storage temperature			-20 to 65°C (-4 to 149°F)								
Operating humidity			20 to 90% RH (non-condensing)								
Storage humidity			20 to 90% RH (non-condensing)								
Vibration / Shock			2.5G / 5.0G								
Environmental rating			IP65 motor body; IP40 shaft; IP20 connector				IP65 (requires SureServo cables)				
Weight without brake		kg	0.5	0.9	1.3	2.5	4.7	4.8	12.0	17.0	
		lb	1.1	1.98	2.87	5.5	10.36	10.58	26.46	37.48	
Weight with brake		kg	0.7	1.4	1.8	3.4	6.3	7.5	19.0	24.0	
		lb	1.54	3.09	3.97	7.5	13.89	16.53	41.89	52.9	
Agency Approvals			CE; UL recognized (U.S. and Canada)								
NOTE: U.S. customary units are for reference only.											



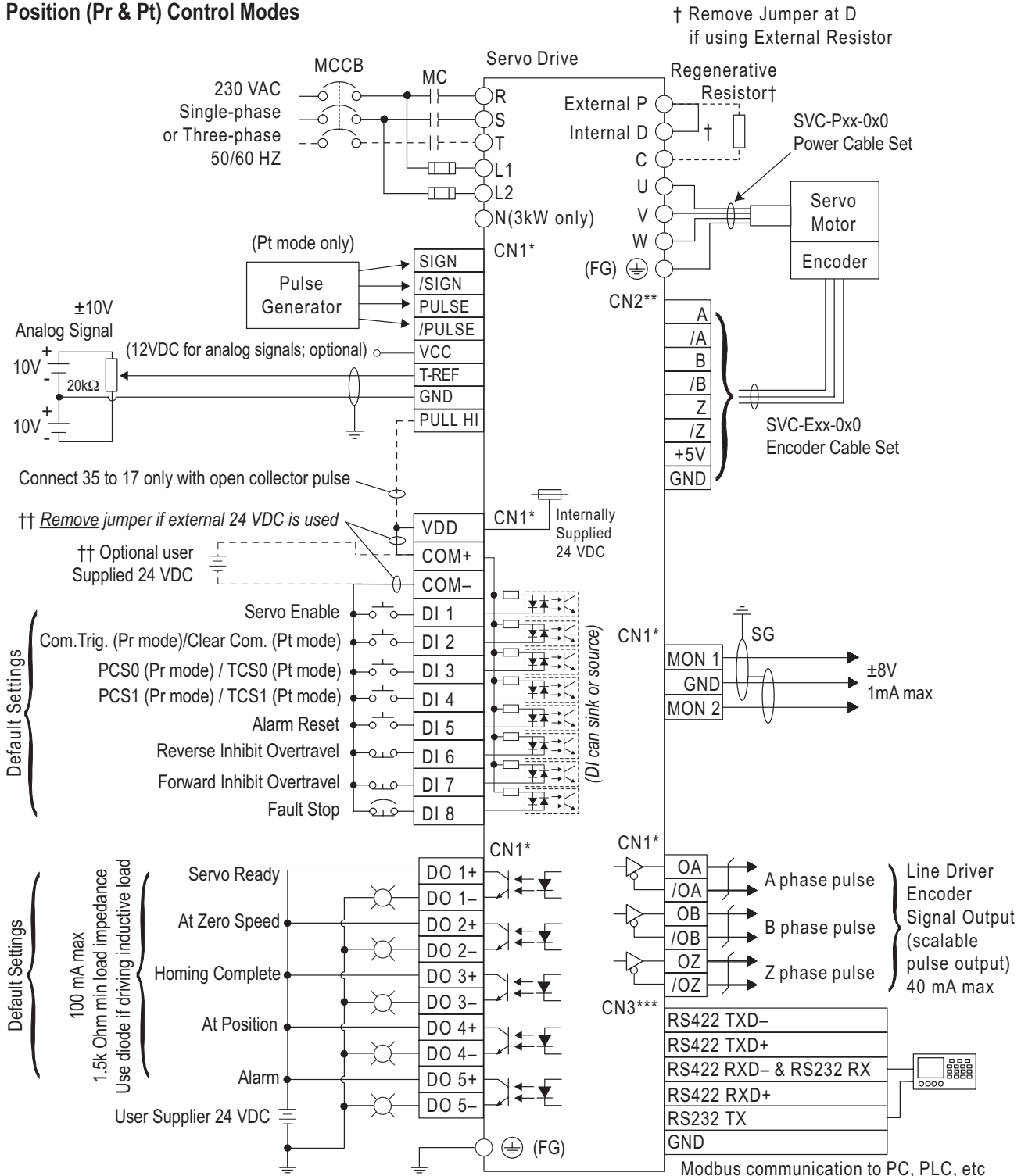
AC Servo System Wiring

Standard wiring examples



THIS WIRING DIAGRAM SHOWS BASIC WIRING ONLY, AND ADDITIONAL WIRING CONFIGURATIONS ARE POSSIBLE FOR SOME I/O. REFER TO THE "INSTALLATION AND WIRING" CHAPTER OF THE USER MANUAL FOR MORE DETAILED WIRING INFORMATION.

Position (Pr & Pt) Control Modes



* Use connection kit part #s ZL-RTB50 & ZL-SVC-CBL-50(-x) for CN1 terminal connections.

** Use cable part # SVC-Exx-0x0 for CN2 terminal connections.

*** Use cable part # SVC-MDCOM-CBL for CN3 terminal Modbus network connections.



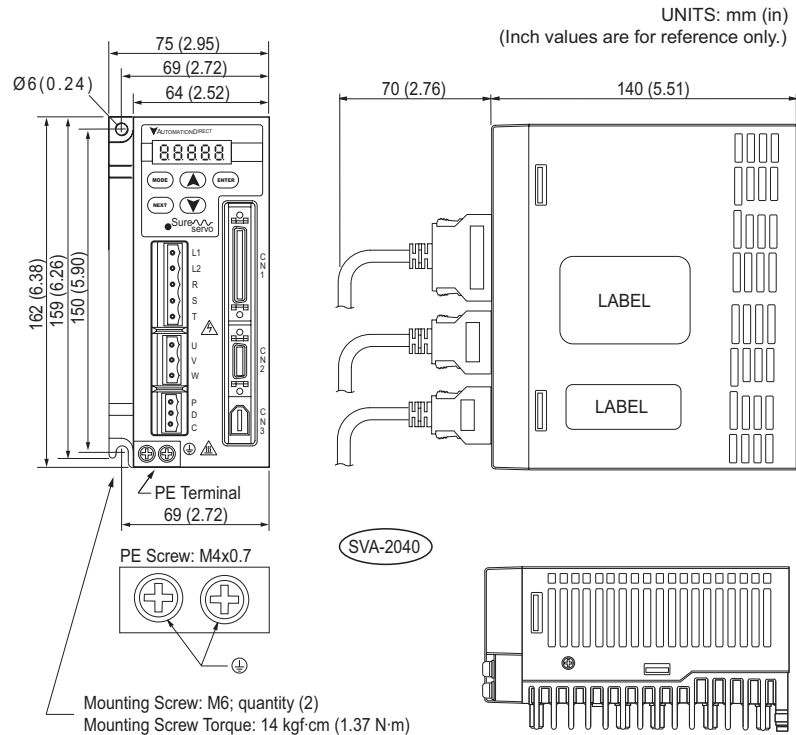
AC Servo System Dimensions

Servo drive dimensions

SVA-2040



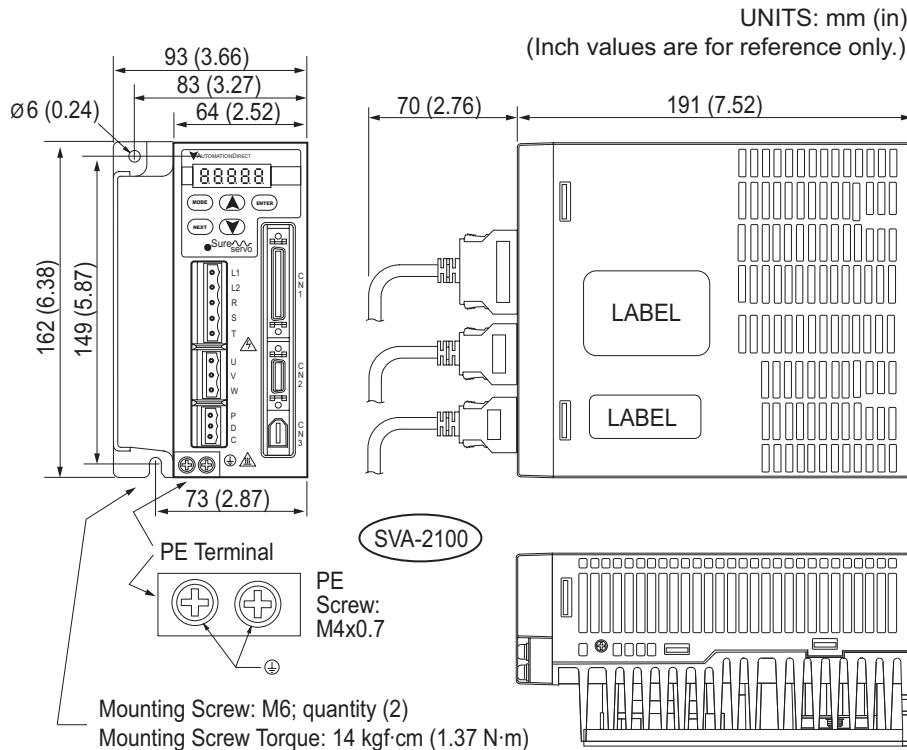
RECOMMENDED USER SUPPLIED MOUNTING SCREW IS M6.
TIGHTEN TO 14 KGF-CM (1.37 N-M).



SVA-2100



RECOMMENDED USER SUPPLIED MOUNTING SCREW IS M6.
TIGHTEN TO 14 KGF-CM (1.37 N-M).





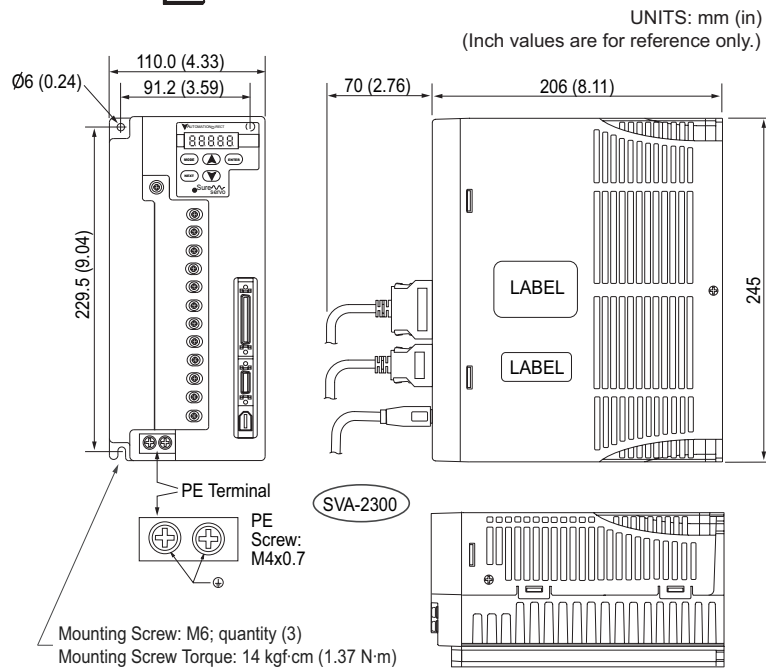
AC Servo System Dimensions

Servo drive dimensions (continued)

SVA-2300

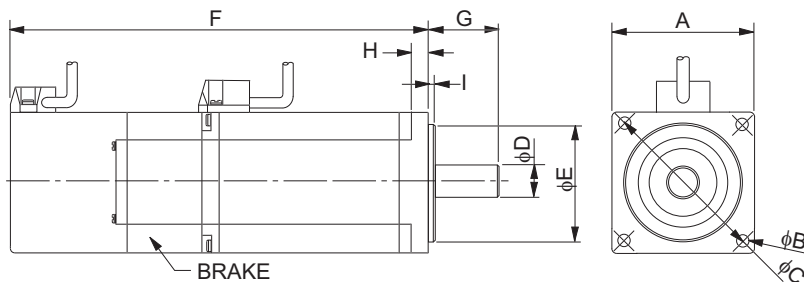


NOTE: RECOMMENDED USER SUPPLIED MOUNTING SCREW IS M6.
TIGHTEN TO 14 KGF·CM (1.37 N·M).



Servo motor dimensions

Low inertia models SVL-201(B), SVL-202(B), SVL-SVL-204(B), SVL-207(B)



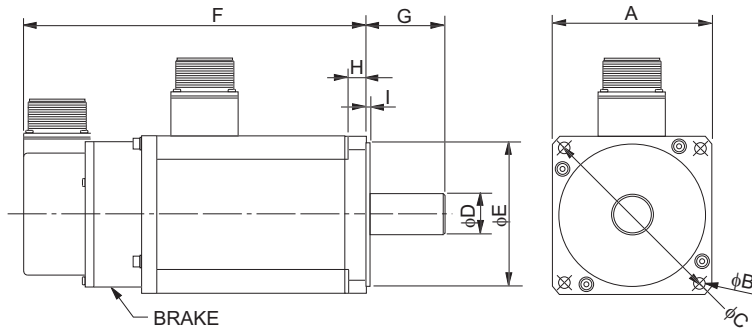
SureServo® Motor Dimensions -100W-750W Low Inertia				
Dimension	SVL-201(B)	SVL-202(B)	SVL-204(B)	SVL-207(B)
A	40 [1.575]	60 [2.362]		80 [3.15]
B	4.5 [0.1772]	5.5 [0.2165]		6.6 [0.2598]
C	46 [1.811]	70 [2.756]		90 [3.543]
D	8 +0.0/-0.009 (8h6)	14 +0.0/-0.011 (14h6)		19 +0.0 -0.013 (19h6)
E	30 +0.0/-0.021 (30h7)	50 +0.0/-0.025 (50h7)		70 +0.0/-0.030 (70h7)
F (w/o brake)	100.1 [3.941]	102.4 [4.032]	124.4 [4.898]	135 [5.315]
F (with brake)	135.7 [5.343]	137 [5.394]	159 [6.26]	171.6 [6.756]
G	25 [0.98]	30 [1.18]		35 [1.38]
H	5 [0.197]	6 [0.236]		8 [0.315]
I	2.5 [0.098]	3 [0.118]		
Cable length	300mm (12 inches)			
UNITS: mm [in]. (Inches are for reference only; not included on diameter dimensions for accuracy.)				



AC Servo System Dimensions

Servo motor dimensions (continued)

Low inertia models SVL-210(B)

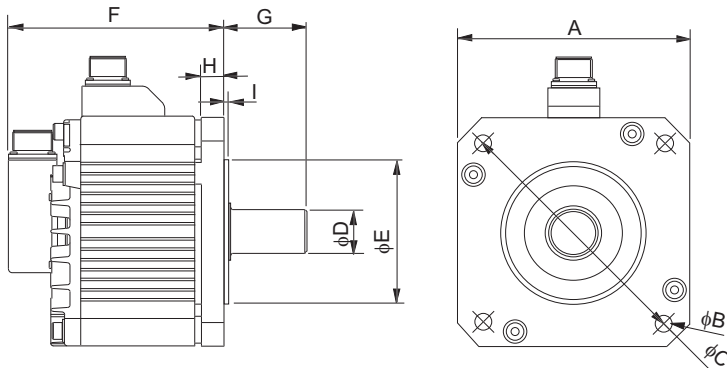


SureServo® Motor Dimensions -1000W Low Inertia

Dimension	SVL-210(B)
A	100 [3.937]
B	9 [0.3543]
C	115 +0.2/-0.2 [4.528]
D	22 +0.0/-0.013 (22h6)
E	95 +0.0/-0.035 (95h7)
F (w/o brake)	158 [6.22]
F (with brake)	190 [7.48]
G	45 [1.77]
H	17 [0.669]
I	7 [0.28]

UNITS: mm [in] (Inches are for reference only; not included on diameter dimensions for accuracy.)

Medium inertia models SVM-210(B), SVM-220(B), SVM-230(B)



SureServo® Motor Dimensions -1000W-3000W Medium Inertia

Dimension	SVM-210(B)	SVM-220(B)	SVM-230(B)
A	130 [5.118]	180 [7.087]	
B	9 [0.3543]	13.5 [0.5315]	
C	145 +0.2/-0.2 [5.709]	200 +0.2/-0.2 [7.874]	
D	22 +0.0/-0.013 (22h6)	35 +0.0/-0.016 (35h6)	
E	110 +0.0/-0.035 (110h7)	114.3 +0/-0.035 (114.3h7)	
F (w/o brake)	143 [5.63]	164 [6.457]	212 [8.35]
F (with brake)	181 [7.126]	213 [8.386]	258 [10.16]
G	55 [2.17]	75 [2.95]	
H	15 [0.591]	20 [0.787]	
I		4 [0.157]	

UNITS: mm [in] (Inches are for reference only; not included on diameter dimensions for accuracy.)

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Flow SwitchesPushbuttons
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AC Servo System Accessories

Accessories

External Regeneration Resistors

Use external resistors to provide additional regenerative capacity and to dissipate heat away from the servo drive.

Part Number	Resistance	SureServo Drives	Price
GS-25P0-BR	40Ω	SVA-2040	\$75.00
GS-2010-BR-ENC	20Ω	SVA-2100, SVA-2300	\$223.00



Resistor GS-25P0-BR

AC Line Filters

Input EMI filters reduce electromagnetic interference or noise on the input side of the servo drive. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

SureServo Drives	AC Input Power	EMI Filter Rating	EMI Filter Part Number	Price
SVA-2040	Single-Phase	250V, 1-phase, 20A	20DRT1W3S	\$76.00
	Three-Phase	250V, 3-phase, 10A	10TDT1W4C	\$81.00
SVA-2100	Single-Phase	250V, 1-phase, 20A	20DRT1W3S	\$76.00
	Three-Phase	250V, 3-phase, 10A	10TDT1W4C	\$81.00
SVA-2300	Three-Phase	250V, 3-phase, 26A	26TDT1W4C	\$113.00
 NOTE: THESE EMI FILTERS ARE ELECTRICALLY COMPATIBLE WITH THE SURESERVO DRIVES. HOWEVER, THEY ARE INTENDED TO BE MOUNTED NEXT TO THE SERVO DRIVE. DO NOT MOUNT THE FILTER UNDER THE DRIVE. THE DRIVE MOUNTING HOLES ON THESE UNITS ARE INTENDED TO BE USED ONLY WITH AUTOMATIONDIRECT'S LINE OF VFDs.				



AC Line Filter 10TDT1W4C

Edison Fuses & Fuji Contactors

SureServo Drives	Input Type	Input Voltage	Edison Fuse - Class CC	Price*	Contactor**	Price
SVA-2040	Main Input Power	230V 3-Phase	HCTR4	\$86.00	SC-E02-xxx	varies
SVA-2100			HCTR7-5	\$98.00	SC-E03-xxx	varies
SVA-2300			HCTR15	\$80.00	SC-E04-xxx	varies
SVA-2040	Control Input Power	230V 1-phase	HCTR4	\$86.00	SC-E02-xxx	varies
SVA-2100			HCTR10	\$87.00	SC-E03-xxx	varies
SVA-2040 SVA-2100 SVA-2300	Control Input Power	230V 1-phase	HCTR2-5	\$89.00		
* Fuses are sold in packages of 10. ** Note: For contactors, xxx = coil voltage (for example, SC-E02-220VAC).						



Edison Fuse HCTR4



Fuji Contactor SC-E02-xxx

The SureGear PGA and PGB series easily mates to SureServo motors.

Everything you need to mount your SureServo motor is included!

It is the perfect solution for applications such as gantries, injection-molding machines, pick-and-place automation, and linear slides.

Quickly and easily configure a system online:
<http://www.sureservo.com/gearbox/selector>

SureGear® Precision Gearboxes for Servo motors Suregear®



**Tough on
the outside,
precision quality
on the inside**

www.automationdirect.com/servos

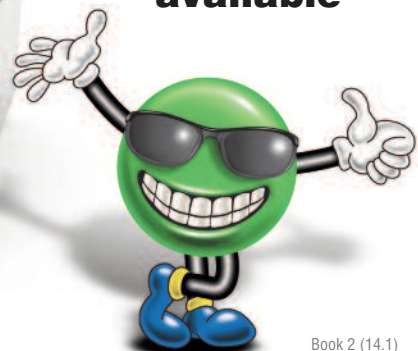


IN-LINE



RIGHT ANGLE

**57 models,
four gear ratios
available**



Motion Control

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eMC-49

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SureGear® Precision Servo Gearboxes

SureGear® Servo Gearbox Overview

PGA In-line Series

The SureGear PGA series of high-precision servo gear reducers is an excellent choice for applications that require good accuracy and reliability at an exceptional value. This in-line planetary gear reducer has a thread-in mounting style, along with a level of precision and torque capacity that is best in its class. Offered in a concentric shaft design with a maximum seven arc-min backlash rating, the SureGear PGA series is an accurate, high-performance, and cost effective solution for any OEM.

The machining quality of the SureGear PGA helical planetary gears provides a very quiet and more efficient reducer than other competitive products that are similarly priced. The SureGear PGA series easily mates to SureServo motors, and is the perfect solution for applications such as gantries, injection-molding machines, pick-and-place automation, and linear slides.

PGB Right-angle Series

The SureGear PGB series of high-precision right-angle servo gear reducers is an excellent choice for applications that require a more compact footprint.

The PGB right-angle planetary gear reducers offer similar technical specifications to the PGA series in-line gear reducers, and provides the customer with an excellent solution when space and clearance requirements are limited.

Offered with a six arc-min backlash rating for 2-stage and nine arc-min backlash for 3-stage, the SureGear PGB series performs to OEMs' demanding expectations.



**SureGear
PGB Gearbox**



SureGear PGB Gearbox

Features

- Industry-standard mounting dimensions
- Thread-in mounting style
- Best-in-class backlash
- Four gear ratios available (5:1, 10:1, 15:1, 25:1)
- Mounting hardware included for attaching to SureServo motors
- Helical-cut planetary gears for quiet operation and reduced vibration
- Right-angle reducer utilizes a spiral bevel gear; motor can be located at a 90° position from the reducer, providing a more compact footprint
- Uncaged needle roller bearings for high rigidity and torque
- Adapter bushing connection for simple and effective attachment to most servo motors
- High-viscosity, anti-separation grease does not migrate away from the gears; no leakage through the seal
- Maintenance free: No need to replace the grease for the life of the unit
- At nominal speed, service life is 20,000 hours
- Can be positioned in any orientation
- IP55 environmental rating
- 5-year warranty

Applications

- Gantries
- Injection-molding machines
- Pick-and-place automation
- Linear slides
- Packaging machines
- Conveyors



**SureGear
2-Stage Cutaway View**

Suregear® Precision Servo Gearboxes

SureGear® Servo Gearbox Selection

SureGear® Servo Gearbox Selection										
Sure Servo Motor	Gear Ratio	SureGear Gearbox	Frame Size (mm)	Motor Nominal Output Torque (N·m [lb·in])	Combination Nominal Output Torque (N·m [lb·in])	Combination Nominal Output Speed (rpm)	Combination Max Output Speed (rpm)	Available Load Inertia @ 5:1 Mismatch * (kg·cm ² [lb·in·s ²])		
		(PGx = PGA or PGB)						PGAxxx-xxxx	PGBxxx-xxxx	
SVL-201(B)	5:1	PGA050-05A1	50	0.32 [2.8]	1.59 [14.1]	600	1,000	2.85 [0.003]	—	
	10:1	PGA050-10A1			3.18 [28.1]	300	500	12.00 [0.011]		
	15:1	PGA050-15A1			4.77 [42.2]	200	333	25.88 [0.023]		
	25:1	PGA050-25A1			7.95 [70.4]	120	200	72.50 [0.064]		
	5:1	PGx070-05A1	70		1.59 [14.1]	600	1,000	1.83 [0.002]	-2.50 [-0.002] **	
	10:1	PGx070-10A1			3.18 [28.1]	300	500	9.40 [0.008]	-8.00 [-0.007] **	
	15:1	PGx070-15A1			4.77 [42.2]	200	333	21.38 [0.019]	17.33 [0.015]	
	25:1	PGx070-25A1			7.95 [70.4]	120	200	60.63 [0.054]	49.38 [0.044]	
SVL-202(B)	5:1	PGx070-05A2	70	0.64 [5.7]	3.20 [28.3]	600	1,000	18.50 [0.016]	34.50 [0.031]	
	10:1	PGx070-10A2			6.40 [56.6]	300	500	76.00 [0.067]	140.00 [0.124]	
	15:1	PGx070-15A2			9.60 [85.0]	200	333	171.00 [0.151]	355.95 [0.315]	
	25:1	PGx070-25A2			16.00 [141.6]	120	200	481.25 [0.426]	990.63 [0.876]	
	15:1	PGB090-15A2	90		9.60 [85.0]	200	333	—	1122.75 [0.993]	
	25:1	PGB090-25A2			16.00 [141.6]	120	200	—	3125.00 [2.764]	
SVL-204(B)	5:1	PGx070-05A2	70	1.27 [11.2]	6.35 [56.2]	600	1,000	38.50 [0.034]	34.50 [0.031]	
	10:1	PGx070-10A2			12.70 [112.4]	300	500	156.00 [0.138]	140.00 [0.124]	
	15:1	PGB090-15A2	90		19.05 [168.6]	200	333	—	290.25 [0.257]	
	25:1	PGB090-25A2			31.75 [281.0]	120	200	—	812.50 [0.719]	
SVL-207(B)	5:1	PGA070-05A3	70	2.39 [21.2]	11.95 [105.8]	600	900	126.00 [0.111]	—	
	5:1	PGB090-05A3			11.95 [105.8]	600	900	—	81.75 [0.072]	
	10:1	PGx090-10A3			23.90 [211.5]	300	450	465.00 [0.411]	338.00 [0.299]	
	15:1	PGx090-15A3			35.85 [317.3]	200	300	1053.00 [0.931]	1080.00 [0.955]	
	25:1	PGx090-25A3			59.75 [528.8]	120	180	2931.25 [2.593]	3006.25 [2.659]	
SVL-210(B)	5:1	PGx090-05A4	70	3.30 [29.2]	16.50 [146.0]	600	900	252.50 [0.223]	218.50 [0.193]	
	10:1	PGx090-10A4			33.00 [292.1]	300	450	1020.00 [0.902]	885.00 [0.783]	
	15:1	PGx120-15A4			120	49.50 [438.1]	200	300	2295.00 [2.030]	1867.50 [1.652]
	25:1	PGx120-25A4				82.50 [730.2]	120	180	6375.00 [5.639]	5225.00 [4.622]
SVM-210(B)	5:1	PGA090-05A5	90	4.80 [42.5]	24.00 [212.4]	400	600	675.00 [0.597]	—	
	10:1	PGA090-10A5			48.00 [424.8]	200	300	2710.00 [2.397]		
	5:1	PGB120-05A5	120		24.00 [212.4]	400	600	—	582.25 [0.515]	
	10:1	PGB120-10A5			48.00 [424.8]	200	300	—	2385.00 [2.110]	
	15:1	PGx120-15A5			72.00 [637.3]	133	200	6097.50 [5.393]	5670.00 [5.015]	
	25:1	PGx120-25A5			120.00 [1062.1]	80	120	16937.50 [14.981]	15787.50 [13.964]	
SVM-220(B)	5:1	PGx120-05A6	155	9.40 [83.2]	47.00 [416.0]	400	600	1700.00 [1.504]	1632.75 [1.444]	
	10:1	PGx120-10A6			94.00 [832.0]	200	300	6800.00 [6.015]	6588.00 [5.827]	
	15:1	PGx155-15A6			141.00 [1239.1]	133	200	15300.00 [13.533]	14384.25 [12.723]	
	25:1	PGx155-25A6			235.00 [2079.9]	80	120	42500.00 [37.591]	40112.50 [35.480]	
	5:1	PGB155-05A6			47.00 [416.0]	400	600	—	1443.00 [1.276]	
	10:1	PGx-155-10A6			94.00 [832.0]	200	300	6800.00 [6.015]	5997.00 [5.304]	
SVM-230(B)	5:1	PGx120-05A6	120	14.30 [126.6]	71.50 [632.8]	400	600	5137.50 [4.544]	5070.25 [4.485]	
	10:1	PGx120-10A6			143.00 [1265.7]	200	300	20550.00 [18.176]	20338.00 [17.989]	
	5:1	PGB155-05A6	155		71.50 [632.8]	400	600	—	4880.50 [4.317]	
	10:1	PGx155-10A6			143.00 [1265.7]	200	300	20550.00 [18.176]	19747.00 [17.466]	

* Available load inertia is calculated based on servo motor inertia using the formula: Available Inertia = (5 x Motor Inertia - Gearbox Inertia) x (Gear Ratio)²

A 5:1 inertia mismatch is a good target for design purposes. Systems with lower or higher mismatch may be possible, depending on operating conditions.

** This gearbox is NOT a suitable choice at a 5:1 mismatch. If inertia balancing is a selection criteria for your end use, please use a mismatch of 8:1 to 10:1.



Company
Information

Drives

Soft Starters

Motors

Power
Transmission

Motion: Servos
and Steppers

Motor Controls

Sensors:
Proximity

Sensors:
Photoelectric

Sensors:
Encoders

Sensors:
Limit Switches

Sensors:
Current

Sensors:
Pressure

Sensors:
Temperature

Sensors:
Level

Sensors:
Flow Switches

Pushbuttons
and Lights

Stacklights

Signal
Devices

Process

Relays and
Timers

Pneumatics:
Air Prep

Pneumatics:
Directional Control
Valves

Pneumatics:
Cylinders

Pneumatics:
Tubing

Pneumatics:
Air Fittings

Appendix
Book 2

Terms and
Conditions

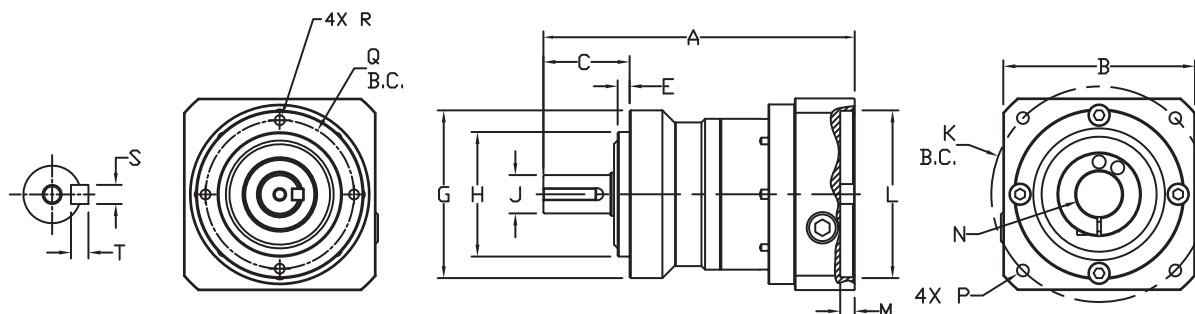
Suregear® Precision Servo Gearboxes

Pricing & Specifications – In-Line Shaft PGA Series

SureGear® Precision Servo Gearboxes – In-Line Shaft PGA Series																									
Part Number	Price	Frame Size (mm)	Ratio	Reduction	Nominal Output Torque (N·m [lb·in])	Max. Acceleration Torque (N·m [lb·in])	Emergency Stop Torque (N·m [lb·in])	Backlash (arc-min)	Nominal Input Speed (rpm)	Max. Input Speed (rpm)	Allowable Radial Load (N [lb])	Allowable Thrust Load (N [lb])	Moment of Inertia (kg·cm ²)	Efficiency (%)	Max. Housing Temperature	Approx Weight (kg [lb])	Environmental Rating	Fits SureServo Servo Motor							
PGA050-05A1	\$398.00	50	5:1	single	9 [80]	18 [159]	35 [310]	5	4000	8000	290 [65]	330 [74]	0.036	95	90 °C [194 °F]	0.7 [1.5]	IP55	SVL-201(B)							
PGA050-10A1	\$419.00		10:1	single	6 [53]	12 [106]	30 [266]				360 [81]	450 [101]	0.030												
PGA050-15A1	\$574.00		15:1	double	6 [53]	12 [106]	30 [266]	7			410 [92]	540 [121]	0.035	90		0.8 [1.8]									
PGA050-25A1	\$574.00		25:1	double	9 [80]	18 [159]	35 [310]				490 [110]	640 [144]	0.034												
PGA070-05A1	\$398.00	70	5:1	single	27 [239]	50 [443]	100 [885]	5	3000	6000	510 [115]	390 [88]	0.077	95		1.5 [3.3]									
PGA070-10A1	\$419.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.056												
PGA070-15A1	\$574.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.055	90							1.7 [3.7]				
PGA070-25A1	\$574.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.053												
PGA070-05A2	\$434.00		5:1	single	27 [239]	50 [443]	100 [885]				510 [115]	390 [88]	0.160	95			1.5 [3.3]								
PGA070-10A2	\$434.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.140												
PGA070-15A2	\$595.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.140	90			1.7 [3.7]								
PGA070-25A2	\$595.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.130												
PGA070-05A3	\$434.00	5:1	single	27 [239]	50 [443]	100 [885]	510 [115]				390 [88]	0.360	95	1.5 [3.3]											
PGA090-10A3	\$514.00	10:1	single	50 [443]	80 [708]	200 [1770]	1200 [270]				1600 [360]	0.750			3.5 [7.7]										
PGA090-15A3	\$679.00	15:1	double	50 [443]	80 [708]	200 [1770]	1400 [315]				1900 [427]	0.720	90	4.0 [8.8]											
PGA090-25A3	\$679.00	25:1	double	75 [664]	125 [1106]	250 [2213]	1600 [360]				2200 [495]	0.710													
PGA090-05A4	\$513.00	90	5:1	single	75 [664]	125 [1106]	250 [2213]				5	2000	4000	960 [216]	1200 [270]	2.900	95	3.5 [7.7]		SVL-210(B)					
PGA090-10A4	\$513.00		10:1	single	50 [443]	80 [708]	200 [1770]							1200 [270]	1600 [360]	2.800									
PGA090-05A5	\$513.00		5:1	single	75 [664]	125 [1106]	250 [2213]							960 [216]	1200 [270]	2.900					90	8.7 [19.2]			
PGA090-10A5	\$513.00		10:1	single	50 [443]	80 [708]	200 [1770]							1200 [270]	1600 [360]	2.800									
PGA120-15A4	\$852.00	120	15:1	double	120 [1062]	225 [1991]	500 [4425]	5	2000	4000				2300 [517]	3000 [674]	2.800	90				8.7 [19.2]		SVL-210(B)		
PGA120-25A4	\$852.00		25:1	double	180 [1593]	330 [2921]	625 [5532]							2700 [607]	3700 [832]	2.800									
PGA120-15A5	\$852.00		15:1	double	120 [1062]	225 [1991]	500 [4425]							2300 [517]	3000 [674]	2.800								95	7.8 [17.2]
PGA120-25A5	\$852.00		25:1	double	180 [1593]	330 [2921]	625 [5532]							2700 [607]	3700 [832]	2.800									
PGA120-05A6	\$680.00		5:1	single	180 [1593]	330 [2921]	625 [5532]				1600 [360]	1900 [427]	11.000	95	16 [35.3]										
PGA120-10A6	\$680.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				2000 [450]	2500 [562]	11.000												
PGA155-10A6	\$840.00	155	10:1	single	240 [2124]	470 [4160]	1000 [8851]				2000	4000	4700 [1057]	4100 [922]	11.000	95	18 [40.0]		SVM-220(B) SVM-230(B)						
PGA155-15A6	\$1,142.00		15:1	double	240 [2124]	470 [4160]	1000 [8851]						5400 [1214]	4900 [1102]	11.000	90									
PGA155-25A6	\$1,142.00		25:1	double	360 [3186]	700 [6196]	1250 [11063]						6400 [1439]	6100 [1371]	11.000										

Suregear® Precision Servo Gearboxes

Dimensions – In-Line Shaft PGA Series



SureGear PGA Series In-Line Shaft Gearboxes Dimension Drawing

SureGear® Precision Servo Gearbox Dimensions – In-Line Shaft PGA Series (dimensions = mm [in])																
Part Number	A	B	C	E	G	H	J	K	L	M	N	P	Q	R	S	T
PGA050-05A1 PGA050-10A1	88.5 [3.48]	42.0 [1.65]	24.5 [0.96]	4.0 [0.16]	Ø50.0 [Ø1.97]	Ø35.0 [Ø1.38]	Ø12.0 [Ø0.47]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø44.0 [Ø0.731]	M4- 0.7x8	4.0 [0.16]	4.0 [0.16]
PGA050-15A1 PGA050-25A1	105.0 [4.13]	42.0 [1.65]	24.5 [0.96]	4.0 [0.16]	Ø50.0 [Ø1.97]	Ø35.0 [Ø1.38]	Ø12.0 [Ø0.47]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø44.0 [Ø0.731]	M4- 0.7x8	4.0 [0.16]	4.0 [0.16]
PGA070-05A1 PGA070-10A1	112.0 [4.41]	52.0 [2.05]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-05A2 PGA070-10A2	115.0 [4.53]	65.0 [2.56]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]	5.0 [0.20]	Ø14.0 [Ø0.55]	M5- 0.8x11	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-05A3	130.0 [5.12]	80.0 [3.15]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6- 1.0x13	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-15A1 PGA070-25A1	131.0 [5.16]	52.0 [2.05]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-15A2 PGA070-25A2	136.0 [5.35]	65.0 [2.56]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]	5.0 [0.20]	Ø14.0 [Ø0.55]	M5- 0.8x11	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA090-10A3	153.0 [6.02]	80.0 [3.15]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6- 1.0x13	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA090-05A4 PGA090-10A4	170.0 [6.69]	100.0 [3.94]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø115.0 [Ø4.53]	Ø95.0 [Ø3.74]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA090-05A5 PGA090-10A5	170.0 [6.69]	130.0 [5.12]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø145.0 [Ø5.71]	Ø95.0 [Ø3.74]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA090-15A3 PGA090-25A3	175.0 [6.89]	80.0 [3.15]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6- 1.0x13	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA120-05A6 PGA120-10A6	225.0 [8.86]	180.0 [7.09]	70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.49]	8.0 [0.31]	Ø35.0 * [Ø1.38]	M12- 1.75x25	Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGA120-15A4 PGA120-25A4	231.5 [9.11]	100.0 [3.94]	70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]	Ø115.0 [Ø4.53]	Ø95.0 [Ø3.74]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGA120-15A5 PGA120-25A5	231.5 [9.11]	130.0 [5.12]	70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]	Ø145.0 [Ø5.71]	Ø110.0 [Ø4.33]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGA155-10A6	264.0 [10.39]	180.0 [7.09]	97.0 [3.82]	12.0 [0.47]	Ø155.0 [Ø6.10]	Ø120.0 [Ø4.72]	Ø40.0 [Ø1.57]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.49]	8.0 [0.31]	Ø35.0 * [Ø1.38]	M12- 1.75x25	Ø140.0 [Ø5.51]	M10- 1.50x28	12.0 [0.47]	8.0 [0.31]
PGA155-15A6 PGA155-25A6	298.5 [11.75]	180.0 [7.09]	97.0 [3.82]	12.0 [0.47]	Ø155.0 [Ø6.10]	Ø120.0 [Ø4.72]	Ø40.0 [Ø1.57]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.49]	8.0 [0.31]	Ø35.0 * [Ø1.38]	M12- 1.75x25	Ø140.0 [Ø5.51]	M10- 1.50x28	12.0 [0.47]	8.0 [0.31]
* Dimension with supplied bushing																
NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.																

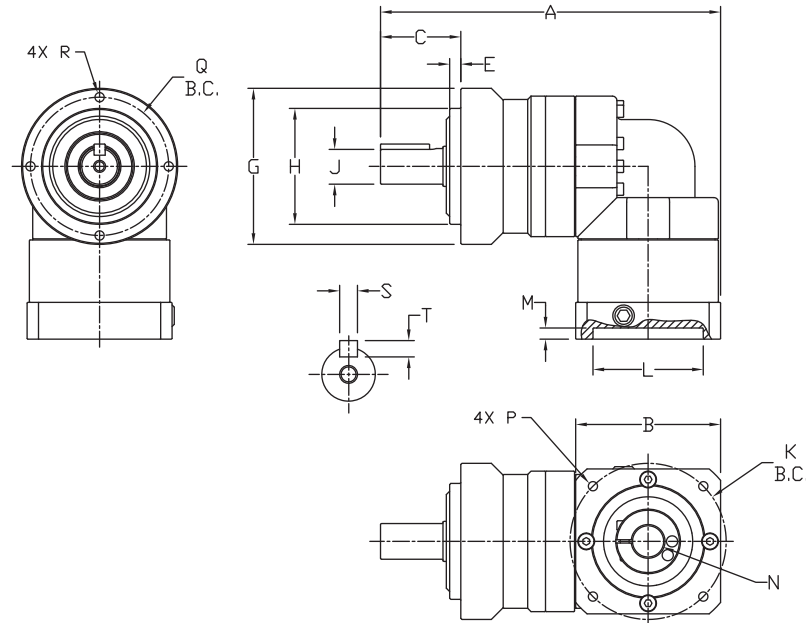
Suregear® Precision Servo Gearboxes

Pricing & Specifications – Right-Angle Shaft PGB Series

SureGear® Precision Servo Gearboxes – Right-Angle Shaft PGB Series																		
Part Number	Price	Frame Size (mm)	Ratio	Reduction	Nominal Output Torque (N·m [lb·in])	Max. Acceleration Torque (N·m [lb·in])	Emergency Stop Torque (N·m [lb·in])	Backlash (arc-min)	Nominal Input Speed (rpm)	Max. Input Speed (rpm)	Allowable Radial Load (N [lb])	Allowable Thrust Load (N [lb])	Moment of Inertia (kg·cm ²)	Efficiency (%)	Max. Housing Temperature	Approx Weight (kg [lb])	Environmental Rating	Fits SureServo Servo Motor
PGB070-05A1	\$674.00	70	5:1	double	22 [195]	40 [354]	80 [708]	6	3000	6000	510 [115]	390 [88]	0.250	93	90 °C [194 °F]	1.9 [4.2]	IP55	SVL-201(B)
PGB070-10A1	\$674.00		10:1	double	16 [142]	32 [283]	65 [575]	6			640 [144]	530 [119]	0.230	93		1.9 [4.2]		
PGB070-15A1	\$852.00		15:1	triple	16 [142]	32 [283]	65 [575]	9			740 [166]	630 [142]	0.073	88		1.7 [3.7]		
PGB070-25A1	\$852.00		25:1	triple	24 [212]	45 [398]	90 [797]	9			870 [196]	790 [178]	0.071	88		1.7 [3.7]		
PGB070-05A2	\$674.00		5:1	double	22 [195]	40 [354]	80 [708]	6			510 [115]	390 [88]	0.320	93		1.9 [4.2]		SVL-202(B) SVL-204(B)
PGB070-10A2	\$674.00		10:1	double	16 [142]	32 [283]	65 [575]	6			640 [144]	530 [119]	0.300	93		1.9 [4.2]		SVL-202(B)
PGB070-15A2	\$852.00		15:1	triple	16 [142]	32 [283]	65 [575]	9			740 [166]	630 [142]	0.118	88		1.7 [3.7]		
PGB070-25A2	\$852.00		25:1	triple	24 [212]	45 [398]	90 [797]	9			870 [196]	790 [178]	0.115	88		1.7 [3.7]		
PGB090-15A2	\$1,040.00	90	15:1	triple	45 [398]	65 [575]	170 [1505]	9			1400 [314]	1900 [427]	0.410	88		4.3 [9.5]	IP55	SVL-202(B) SVL-204(B)
PGB090-25A2	\$1,040.00		25:1	triple	65 [575]	110 [974]	220 [1947]	9			1600 [360]	2200 [495]	0.400	88		4.3 [9.5]		
PGB090-05A3	\$797.00		5:1	double	65 [575]	90 [797]	220 [1947]	6			960 [216]	1200 [270]	2.130	93		4.9 [10.8]		SVL-207(B)
PGB090-10A3	\$797.00		10:1	double	45 [398]	65 [575]	170 [1505]	6			1200 [270]	1600 [360]	2.020	93		4.9 [10.8]		
PGB090-15A3	\$1,040.00		15:1	triple	45 [398]	65 [575]	170 [1505]	9			1400 [314]	1900 [427]	0.600	88		4.3 [9.5]		
PGB090-25A3	\$1,040.00		25:1	triple	65 [575]	110 [974]	220 [1947]	9			1600 [360]	2200 [495]	0.590	88		4.3 [9.5]		
PGB090-05A4	\$797.00		5:1	double	65 [575]	90 [797]	220 [1947]	6			960 [216]	1200 [270]	4.260	93		4.9 [10.8]		SVL-210(B)
PGB090-10A4	\$797.00		10:1	double	45 [398]	65 [575]	170 [1505]	6			1200 [270]	1600 [360]	4.150	93		4.9 [10.8]		
PGB120-15A4	\$1,293.00	120	15:1	triple	110 [974]	200 [1770]	450 [3983]	9			2300 [517]	3000 [674]	4.700	88		10 [22]	IP55	SVM-210(B)
PGB120-25A4	\$1,293.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]	9			2700 [607]	3700 [832]	4.640	88		10 [22]		
PGB120-05A5	\$1,040.00		5:1	double	120 [1062]	240 [2124]	500 [4425]	6			1600 [360]	1900 [427]	6.610	93		10.2 [22.5]		
PGB120-10A5	\$1,040.00		10:1	double	110 [974]	200 [1770]	450 [3983]	6			2000 [450]	2500 [562]	6.050	93		10.2 [22.5]		
PGB120-15A5	\$1,293.00		15:1	triple	110 [974]	200 [1770]	450 [3983]	9			2300 [517]	3000 [674]	4.700	88		10 [22]		SVM-220(B) SVM-230(B)
PGB120-25A5	\$1,293.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]	9			2700 [607]	3700 [832]	4.640	88		10 [22]		
PGB120-05A6	\$1,040.00		5:1	double	120 [1062]	240 [2124]	500 [4425]	6			1600 [360]	1900 [427]	13.690	93		10.2 [22.5]		
PGB120-10A6	\$1,040.00		10:1	double	110 [974]	200 [1770]	450 [3983]	6			2000 [450]	2500 [562]	13.120	93		10.2 [22.5]		
PGB155-15A6	\$1,514.00	155	15:1	triple	200 [1770]	400 [3540]	750 [6638]	9	2000	4000	5400 [1214]	4900 [1102]	15.070	88	IP55	20.4 [45.0]	SVM-220(B)	
PGB155-25A6	\$1,514.00		25:1	triple	300 [2655]	600 [5310]	1100 [9736]	9			6400 [1439]	6100 [1371]	14.820	88		20.4 [45.0]		
PGB155-05A6	\$1,198.00		5:1	double	200 [1770]	400 [3540]	1100 [9736]	6			3800 [854]	3000 [674]	21.280	93		19.8 [43.7]	SVM-220(B) SVM-230(B)	
PGB155-10A6	\$1,198.00		10:1	double	200 [1770]	400 [3540]	750 [6638]	6			4700 [1057]	4100 [922]	19.030	93		19.8 [43.7]		

Suregear® Precision Servo Gearboxes

Dimensions – Right-Angle Shaft PGB Series



SureGear PGB Series Right-Angle Shaft Gearboxes Dimension Drawing

SureGear® Precision Servo Gearbox Dimensions – Right-Angle Shaft PGA Series (dimensions = mm [in])																	
Part Number	A	B	C	E	G	H	J	K	L	M	N	P	Q	R	S	T	
PGB070-05A1 PGB070-10A1	151.5 [5.96]	52.0 [2.05]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4-0.7x9	Ø62.0 [Ø2.44]	M5-0.8x10	5.0 [0.20]	5.0 [0.20]	
PGB070-05A2 PGB070-10A2		65.0 [2.56]						Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]		Ø14.0 [Ø0.55]	M5-0.8x11					
PGB070-15A1 PGB070-25A1	158.0 [6.22]	52.0 [2.05]						Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]		Ø8.0 [Ø0.31]	M4-0.7x9					
PGB070-15A2 PGB070-25A2	163.5 [6.44]	65.0 [2.56]						Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]		Ø14.0 [Ø0.55]	M5-0.8x11					
PGB090-15A2 PGB090-25A2	204.5 [8.05]		46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6-1.0x13	Ø80.0 [Ø3.15]	M6-1.0x12	6.0 [0.24]	6.0 [0.24]	
PGB090-05A3 PGB090-10A3	205.5 [8.09]	80.0 [3.15]						Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]		Ø19.0 [Ø0.75]	M6-1.0x13					
PGB090-15A3 PGB090-25A3	210.5 [8.29]																
PGB090-05A4 PGB090-10A4	205.5 [8.09]	100.0 [3.94]						Ø115.0 [Ø4.53]	Ø95.0 [Ø3.74]								
PGB120-15A4 PGB120-25A4	272.0 [10.71]		70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]	Ø145.0 [Ø5.71]	Ø110.0 [Ø4.33]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8-1.25x17	Ø108.0 [Ø4.25]	M8-1.25x16	10.0 [0.39]	8.0 [0.31]	
PGB120-05A5 PGB120-10A5	266.0 [10.47]	130.0 [5.12]															
PGB120-15A5 PGB120-25A5	272.0 [10.71]																
PGB120-05A6 PGB120-10A6	268.5 [10.57]																
PGB155-05A6 PGB155-10A6	341.0 [13.43]	180.0 [7.09]	97.0 [3.82]	12.0 [0.47]	Ø155.0 [Ø6.10]	Ø120.0 [Ø4.72]	Ø40.0 [Ø1.57]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.50]		Ø35.0 * [Ø1.38]	M12-1.75x25	Ø140.0 [Ø5.51]	M10-1.5x20	12.0 [0.47]		
PGB155-15A6 PGB155-25A6	364.0 [14.33]																
* Dimension with supplied bushing																	
NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.																	

Company
Information

Drives

Soft Starters

Motors

Power
TransmissionMotion: Servos
and Steppers

Motor Controls

Sensors:
ProximitySensors:
PhotoelectricSensors:
EncodersSensors:
Limit SwitchesSensors:
CurrentSensors:
PressureSensors:
TemperatureSensors:
LevelSensors:
Flow SwitchesPushbuttons
and Lights

Stacklights

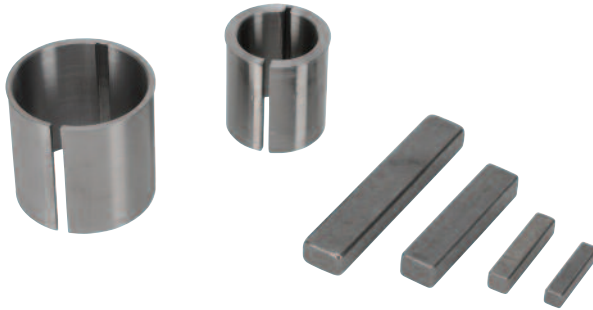
Signal
Devices

Process

Relays and
TimersPneumatics:
Air PrepPneumatics:
Directional Control
ValvesPneumatics:
CylindersPneumatics:
TubingPneumatics:
Air FittingsAppendix
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Conditions

Suregear® Precision Servo Gearboxes

SureGear® Servo Gearbox Replacement Parts



SureGear® Precision Servo Gearboxes – Replacement Parts		
Part Number	Price	Description
PG050-KEY	\$4.00	Output Shaft Key, replacement, 4 x 4 x 14 mm, for SureGear PGA050 series gearboxes.
PG070-KEY	\$4.00	Output Shaft Key, replacement, 5 x 5 x 22 mm, for SureGear PGA070 and PGB070 series gearboxes.
PG090-KEY	\$4.00	Output Shaft Key, replacement, 6 x 6 x 28 mm, for SureGear PGA090 and PGB090 series gearboxes.
PG120-KEY	\$4.00	Output Shaft Key, replacement, 10 x 8 x 45 mm, for SureGear PGA120 and PGB120 series gearboxes.
PG155-KEY	\$4.00	Output Shaft Key, replacement, 12 x 8 x 65 mm, for SureGear PGA155 and PGB155 series gearboxes.
PGA4-A5-BUSH	\$19.00	Input Shaft Bushing, replacement, 28 x 22 x 30.5 mm, for all SureGear gearboxes using SVL-210(B) and SVM-210(B) SureServo motors.
PGA6-BUSH	\$19.00	Input Shaft Bushing, replacement, 38 x 35 x 36 mm, for all SureGear gearboxes using SVM-220(B) and SVM-230(B) SureServo motors.